

AGRICULTURAL RESEARCH INSTITUTE

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Concordia toll the Name from

THE BRITISH PHARMACEUTICAL CONFERENCE

AN ORGANISATION FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH AND THE PROMOTION OF FRIENDLY INTERCOURSE AMONGST PHARMACISTS.

This Association of Chemists and Druggists and others interested in Pharmacy is managed by about twenty unpaid officers annually elected by the members.

ANNUAL MEETINGS OF MEMBERS.

1863, NEWCASTLE. 1864, BATH 1865, BIRMINGHAM. 1866, NOTTINGHAM. 1867, DUNDEE. 1868, NORWICH. 1869, EXETER 1870, LIVERPOOL. 1871, EDINBURGH. 1872, BRIGHTON. 1873, BRADFORD. 1874, LONDON. 1875, BRISTOL. 1876, GLASGOW. 1877, PLYMOUTH. 1878, DUBLIN. 1879, SHEFFIELD. 1880, SWANSEA. 1881, YORK. 1882, SOUTHAMPTON. 1883, SOUTHPORT. 1884, HASTINGS 1885, ABERDEEN. 1886, BIRMINGHAM. 1887, MANCHESTER. 1888, BATH 1889, NEWCASTLE-ON-TYNE 1890, LEEDS. 1891, CARDIFF. 1892, EDINBURGH. 1893, NOTTINGHAM. 1894 OXFORD 1895, BOURNEMOUTH.

The chief business of the meetings is the communication of written descriptions of original investigations made by members during the year, and includes discussions on such papers by the assembled members and others.

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THE YEAR-BOOK OF PHARMACY AND TRANSACTIONS.

The Conference annually presents to members a handsome octavo volume of about 600 pages, containing the proceedings at the yearly meeting, and a report on the progress of pharmacy, or YEAR-BOOK, comprising abstracts of papers on pharmacy, materia medica, and chemistry, and on new preparations, processes, and formulæ, published at home and abroad during each year. The funds of the Conference, composed of annual subscriptions of seven shillings and sixpence, are devoted to the production of this useful book, no pains being spared to make it the desk companion of the year, and an invaluable permanent work of reference for every chemist and druggist. The Executive Committee of the Conference trusts that members will show the current Year-Book to their friends and acquaintances—principals, assistants, or pupils—and obtain as large a number of new members as possible. An alphabetical list of the names and addresses of subscribers will be found in each Year-Book.

NOMINATION FOR MEMBERSHIP.

Gentlemen desiring to join the Conference can be nominated at any time on applying to a Secretary or any other Officer or member. The Name and Address of each candidate should be written legibly, and forwarded to "The Asst. Secretary," British Pharmaceutical Conference, 17, Bloomsbury Square, London, W.C., together with the subscription.

THE ANNUAL SUBSCRIPTION.

The Conference year commences on July 1st, and Annual Subscriptions are due in advance on that date. The amount, which includes free delivery of the Year-Book, is 7*s.* 6*d.* for members residing within the Postal Union.

Remittances may be made by Postal or Post Office Order, crossed "& Co" made payable to the *British Pharmaceutical Conference*, at the "High Holborn" Post Office, or by Cheque, and should be addressed as follows:—"*The Asst. Secretary, Brit. Pharm. Conf.*, 17, *Bloomsbury Square, London, W.C.*"

To all members who have previously paid the Annual Subscription, the Year-Book, including Transactions, is posted as soon as published in October, and to other members immediately on receipt of the Subscription.

Extra copies of the Year-Book and Transactions for 1870 and subsequent issues, will be sent to members on receipt of Subscription as above, for each additional copy. To non-members, the price is Ten Shillings per volume, exclusive of postage.

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YEAR-BOOK OF PHARMACY

COMPRISING

ABSTRACTS OF PAPERS

RELATING TO

PHARMACY, MATERIA MEDICA, AND CHEMISTRY

CONTRIBUTED TO BRITISH AND FOREIGN JOURNALS,

FROM JULY 1, 1893, TO JUNE 30,

1894.

WITH THE

TRANSACTIONS

OF THE

BRITISH PHARMACEUTICAL CONFERENCE

AT THE

THIRTY-FIRST ANNUAL MEETING

HELD AT

OXFORD,

AUGUST, 1894.

LONDON:
J. & A. CHURCHILL, 11, NEW BURLINGTON STREET.
MDCCCXCIV.

YEAR-BOOK OF PHARMACY AND TRANSACTIONS

OF THE

British Pharmaceutical Conference.

1893-94.

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THE

BRITISH PHARMACEUTICAL CONFERENCE.

AN ORGANIZATION ESTABLISHED IN 1863 FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH, AND THE PROMOTION OF FRIENDLY INTERCOURSE AND UNION AMONGST PHARMACISTS.

THE most important ways in which a member can aid the objects of the Conference are by suggesting subjects for investigation, working upon subjects suggested by himself or by others, contributing information tending to throw light on questions relating to adulterations and impurities, or collecting and forwarding specimens whose examination would afford similar information. Personal attendance at the yearly gatherings, or the mere payment of the annual subscription, will also greatly strengthen the hands of the executive.

A list of subjects suggested for research is sent to members early in the year. Resulting papers are read at the annual meeting of the members; but new facts that are discovered during an investigation may be at once published by an author at a meeting of a scientific society, or in a scientific journal, or in any other way he may desire; in that case, he is expected to send a short report on the subject to the Conference.

The annual meetings are usually held in the provinces, at the time and place of the visit of the British Association; that for 1895 will be held at Bournemouth.

Gentlemen desiring to join the Conference can be nominated at any time on applying to the Secretary, or any other officer or member. The yearly subscription is payable in advance, on July 1st. The amount, which includes free delivery of the Year-Book, is 7*s*. 6*d*. for members residing within the Postal Union. Further information may be obtained from

THE ASST. SECRETARY; BRIT. PHARM. CONF.,
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THE YEAR-BOOK OF PHARMACY.

The Conference annually presents to members a volume of about 600 pages, containing the proceedings at the yearly meeting, and an Annual Report on the Progress of Pharmacy, or Year-Book, which includes notices of all pharmaceutical papers, new processes, preparations, and formulæ published throughout the world. The necessary fund for accomplishing this object consists solely of the subscriptions of members. The Executive Committee, therefore, call on every pharmacist—principal, assistant, or pupil—to offer his name for election, and on every member to make an effort to obtain more members. The price of the Year-Book to non-members is ten shillings. The constitution and rules of the Conference, and a convenient form of nomination, will be found at page 279.

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ERRATA.

Page 29, line 40, *after* F. B. Burls *add* R. E. Evans and C. H. Desch.
Page 41, line 18, *for* oscine *read* benzoyloscine.
Page 108, line 28, *for* Autenreith *read* Autenrieth.
Page 132, line 16, *for* Septentironale *read* Septentrionale
Page 154, line 26, *for* Cheledonium *read* Chelidonium.
Page 160, line 35, *for* highly *read* very active.
Page 189, line 11, *for* V Coblentz *read* W. Coblentz.

INTRODUCTION.

A BRIEF allusion to the recent literature of the aconite bases, such as formed the subject of our opening observations in the introductory chapter of the preceding volume, may fitly occupy the same place again in the present work on account of the new and interesting light thrown upon the nature of these bodies by further researches. The latest results obtained by W. R. Dunstan, in conjunction with E. F. Harrison and F. H. Carr, show that picraconitine, the amorphous alkaloid previously described by T. B. Groves and C. R. A. Wright, is identical with isaconitine. It further appears that the conversion of aconitine into isaconitine invariably precedes the hydrolysis of the former into aconine and benzoic acid, that this conversion is always accompanied by the formation of a definite and constant proportion of acetic acid, and that aconitine must therefore be regarded as acetyl-benzoyl-aconine, and isaconitine (picraconitine) as benzoyl-aconine. In accordance with these views, the changes occurring in the hydrolysis of aconitine, and the alterations which have become necessary in the formulæ of isaconitine and aconine, are represented by the following equations:—

$$\underset{\text{Aconitine.}}{C_{33}H_{45}NO_{12}} + H_2O = \underset{\text{Acetic acid.}}{C_2H_4O_2} + \underset{\text{Benzoyl-aconine, or Isaconitine (Picraconitine).}}{C_{31}H_{43}NO_{11}}$$

$$\underset{\text{Benzoyl-aconine.}}{C_{31}H_{43}NO_{11}} + H_2O = \underset{\text{Benzoic acid.}}{C_7H_6O_2} + \underset{\text{Aconine.}}{C_{24}H_{39}NO_{10}}$$

It has further been observed that when aconitine is heated at its melting-point it is decomposed into acetic acid and *pyraconitine* (anhydro-benzoyl-aconine), $C_{31}H_{41}NO_{10}$, a new base which yields on hydrolysis benzoic acid and *pyraconine* (anhydro-aconine), $C_{24}H_{37}NO_9$, and agrees with isaconitine in being non-poisonous. The formation from aconitine of a constant quantity

of acetic acid on heating or by hydrolysis, promises to serve as the basis of a satisfactory process for the assay and standardisation of galenical preparations of aconite. The identity of isaconitine and Groves and Wright's picraconitine, as well as the formation of this body along with acetic acid in the first stage of the action of boiling water on aconitine, have also been observed, independently of W. R. Dunstan and his collaborators, and practically at the same time, by M. Freund and P. Beck, who differ, however, from the former in assigning to aconitine the formula $C_{34}H_{47}NO_{11}$, and to aconine the formula $C_{25}H_{41}NO_9$. Further investigations must be awaited to clear up this discrepancy.

Hyoscine, it appears, can no longer be regarded as a distinct alkaloid. A renewed study of this body by O. Hesse supplies further evidence in support of the opinion previously expressed both by E. Schmidt and himself, that it entirely agrees in composition and characters with scopolamine. The same author also confirms E. Merck's observation respecting the identity of atropamine with apoatropine, and deals with the conditions under which this base is converted into belladonnine. An alkaloid obtained from the root of *Solanum carolinense* is described by J. U. Lloyd under the provisional name of "Solnine."

A recent investigation of narceïne by M. Freund and G. B. Frankforter leads these chemists to infer that the generally accepted formula of this body should be altered to $C_{23}H_{27}NO_8 + 3H_2O$, and that pseudonarceïne, the product obtained by Roser on heating narcotine methiodide with alkalies, is identical with narceïne. The constitution of morphine has received the attention of G. N. Vis, while the estimation of this alkaloid in opium forms the subject of a report by D. B. Dott. Protopine, an opium base occurring also in the roots of *Sanguinaria canadensis* and *Chelidonium majus*, has been again prepared from the two last-named sources by E. Schmidt, G. Koenig, and W. Tietz, whose results confirm the identity of the products, and also establish the perfect agreement between samples of chelerythrine likewise obtained from the roots of these two members of the *Papaveraceæ*.

The cause of the conflicting statements published with regard to the melting-point of cocaïne hydrochloride will be readily understood from O. Hesse's observation that the temperature at which this salt fuses varies very greatly according to the manner and apparatus in which the heating is conducted. It is shown that, under different circumstances, fusion may take place at

200–202° C., at 186°, at 160–161°, and even at as low a temperature as 152–154° C.; and it is clear, therefore, that the melting-point of this salt affords no criterion of its purity unless the conditions under which it is to be ascertained are definitely stated. New tests for the recognition of cocaïne are described by M. Lewy and M. Schaerges, and the same service has been performed with regard to colchicine by E. Barillot, and with regard to eserine by J. E. Saul, A. J. F. da Silva, and J. B. Nagelvoort. W. Duncan has examined the crystals depositing in acidified solutions of strychnine hydrochloride, and finds that they consist of the neutral and not of an acid salt as has been assumed. Directions for the preparation of strychnine nitrate in the form of perfectly colourless crystals are given by E. Guignet. The literature of the cinchona alkaloids has received further contributions at the hands of O. Hesse, E. Grimaux, E. Léger, E. Jungfleisch, E. Lippmann and F. Fleissner, dealing, for the most part, with derivatives of these bases. Caffearine, a new alkaloid from coffee, is reported upon by P. Palladino, and shown to have a composition corresponding to the formula $C_{14}H_{16}N_2O_4$. Processes for the estimation of caffeine are published by M. Guillot and by A. Grandval and H. Lajoux while the separation and determination of theobromine and caffeine have engaged the attention of W. E. Kunze, and of H. Brunner and H. Leins. The bases contained in the bark of pomegranate root are again discussed by G. Ciamician and P. Silber, who suggest that the name pseudopelletierine should be changed to granatonine, in order to bring the nomenclature of its derivatives into uniformity with those of tropine, which it closely resembles, and of which it is probably a higher homologue. This proposal, however, is protested against by C. Tanret. Canadine, from the rhizome of *Hydrastis canadensis*, is found by E. Schmidt to be tetrahydroberberine, and to yield berberine on exposure of its solution to light and air. Further accounts of hydrastine by M. Freund and F. Lutze, of gelseminine by L. Spiegel, of sparteïne by F. B. Ahrens, of corydaline by J. J. Dobbie and A. Lauder, and of nicotine by F. Blau, A. Étard, and A. Pinner, are mainly devoted to the consideration of compounds, derivatives, or decomposition products of these alkaloids. Nicotine is also referred to by G. B. de Toni and G. Heut, the former of whom has investigated its distribution in various parts of the tobacco plant, whereas the latter describes an acidimetric process for the estimation of both nicotine and coniine, when occurring together

in an aqueous solution. The purification of coniine, and the rotatory power of this base and its salts, are dealt with by J. Schorm and F. Zecchini respectively.

S. v. Kostanecki and J. Tambour have succeeded in effecting the synthesis of gentisin by heating a mixture of molecular proportions of hydroquinonecarboxylic acid and phloroglucinol with acetic acid, and converting the gentiseïn thus obtained as a sublimate into its methyl ether by treatment with methyl iodide and potassium hydrate. The product is found to be identical with natural gentisin. The results of an investigation of cotoïn by G. Ciamician and P. Silber render it probable that this body is the monomethyl ether of benzoylphloroglucinol, and indicate that its correct formula is $C_{14}H_{12}O_4$, and not $C_{22}H_{18}O_6$, as stated by Jobst and Hesse. According to the same authors, the formula of paracotoïn should be altered from $C_{19}H_{12}O_6$ to $C_{12}H_8O_4$. Various derivatives of santonin are described by J. Klein and A. Andreocci, with the object of throwing additional light on the constitution of this body. Further information respecting the preparation of pure digitonin is furnished by H. Kiliani, who also gives an account of a number of products of change obtained from digitogenin. Iridin, a glucoside existing in the rhizome of *Iris Florentina*, is shown to have a composition corresponding to the formula $C_{24}H_{26}O_{13}$, and to split up on hydrolysis into glucose and irigenin, $C_{18}H_{16}O_8$. The tannin from the root bark of *Punica Granatum* has been examined by J. Culley, and is regarded by him as identical with gallotannic acid. The tannin of tea, on the other hand, is found by A. Hilger and F. Tretzel to have the composition and general properties of an anhydride of digallic acid, and not those of a glucoside. Acetone is recommended by H. Trimble and J. C. Peacock as a very suitable solvent for the extraction of tannin from oak bark. The tannins obtained from the barks of four different species of oak indigenous to India appear to be identical with each other, and also with that extracted from American oak barks. E. Fischer reports upon a number of crystalline artificial glucosides obtained by saturating solutions of glucose in different alcohols with hydrochloric acid gas. Some of these bodies are stated to have a sweet and others a bitter taste, and all appear to agree with natural glucosides in not reacting with Fehling's solution and other sugar tests without being previously boiled with dilute acids.

Attention is called by G. B. Schmidt to A. Andouard's description of the distinctive characters of chrysarobin and chrysophanic

acid, which he considers as much more correct than those met with in the leading Pharmacopœias. As regards chrysarobin, the unsatisfactory nature of some of the Pharmacopœial and other tests are likewise pointed out by E. J. Millard. Pure cathartic acid, as reported upon by A. Gensz, appears to have a composition represented by the formula $C_{30}H_{36}NO_{15}$, and to differ materially from preparations of variable composition previously known by the same name. The various acid principles hitherto obtained from the resin of pine trees, and distinguished as abietic, sylvic and pimaric acids, are shown by H. Mach to be identical.

An examination of commercial samples of sugar of milk by J. O. Braithwaite reveals the fact that notable quantities of magnesium lactate occasionally occur in this preparation, and impart to it the undesirable property of causing coagulation of caseïn when added to boiling milk. The presence of this impurity is attributed to the use of magnesia or magnesium carbonate in the process of manufacture of the milk sugar with the object of neutralising the acidity of the whey during crystallization. It is therefore suggested that in the official tests for the purity of sugar of milk the amount of ash should be directed to be determined, and should not be allowed to exceed 0·25 per cent. The spontaneous inversion of cane sugar which has been sometimes observed to take place in aqueous solutions is found by A. Béchamp to be brought about by the presence of organisms. F. B. Burls, in conjunction with R. E. Evans and C. H. Desch, records the interesting observation that cane sugar and other carbohydrates, when treated with nitric acid, give rise to the formation of appreciable quantities of hydrocyanic acid. The action of diastase on starch is shown by C. J. Lintner and G. Düll to result in the formation of five distinct products, viz., isomaltose, maltose, and three dextrins, for which the names *amylodextrin*, *erythrodextrin*, and *achroodextrin* are suggested. G. Rouvier has further investigated the reaction between starch and iodine under varying conditions, and has obtained four definite compounds containing sixteen molecules of starch in combination with two, three, four and five atoms of iodine respectively.

D. Brown has again given attention to the decomposition of chloroform both in the presence and the absence of alcohol, and arrives at the conclusion that, while the retarding effect of alcohol on this decomposition may be regarded as a fully proved fact, a satisfactory explanation of its preservative action remains still a desideratum. Requirements as to characters and tests for the purity of chloroform are suggested by D. B. Dott.

The occurrence of ozone and of hydrogen peroxide in the air is called in question by Ilosva on the ground that the reagents usually employed for the detection of these substances are affected in precisely the same manner by nitrogen peroxide, which has been proved to be a constant constituent of the atmosphere. In his opinion, no satisfactory evidence has yet been brought forward to warrant the conclusion that either of the substances named is present in the air or in rain water. G. Kassner recommends the use of calcium plumbate in a porous condition as a means for obtaining a cheap supply of oxygen from the air. The pungent gas with which oxygen obtained from a mixture of potassium chlorate and manganese dioxide is invariably contaminated, is found by O. Brunck to be ozone; but a subsequent research by H. McLeod seems to afford satisfactory proof that the impurity in question is chlorine, as has been generally supposed. A steady current of pure oxygen for medicinal purposes is obtained by M. Delamotte from a mixture of sodium peroxide and sand by the gradual addition of water. J. Ball directs attention to the very marked accelerating influence produced by a few drops of solutions of cobalt or nickel salts on the evolution of hydrogen from zinc and dilute acids. It may here be mentioned that solutions of platinum perchloride, arsenical compounds, and several other metallic salts have long been known to have a similar action. Processes for the purification of commercial solutions of hydrogen peroxide are suggested by H. P. Talbot and H. R. Moody. A new sulphide of carbon, possessing very characteristic and interesting properties and corresponding in composition to the formula $C_3 S_2$, is described by B. v. Lengyel, and is produced by the action of an electric current on the vapour of carbon bisulphide. J. W. Retgers reports that red phosphorus, which has hitherto been regarded as amorphous, exhibits a distinct crystalline structure when examined by means of the polarization microscope in a highly refractive medium. The same subject is dealt with by W. Muthmann, who arrives at the conclusion that red phosphorus is dimorphous, and that the commercial product is generally a mixture of the crystalline and the amorphous forms. G. Lunge refers once more to the constitution of bleaching powder, and replaces the formula $Ca(OH)_2 Cl_2$, previously suggested by him, by $Ca O Cl_2, H_2 O$, which is more in harmony with the view expressed by Odling and others. The instability of aqueous solutions of mercuric chloride is discussed by E. Burcker, whose results indicate that the decomposition is due in the first instance to impurities in the water used

as a solvent and is subsequently increased by the action of light and air.

A good deal of attention has recently been devoted to the study of constituents of essential oils. G. Bouchardat affirms the existence of a dextrogyre camphene associated with borneol in the oil of *Lavandula spica*, and the same constituents are observed by Oliviero to occur in oil of valerian, though in the latter case they appear to be lævo-rotatory. P. Barbier gives a further account of coriandrol, rhodinol, geraniol, and licareol, and also reports on licarhodol, a new body obtained by him from the latter. An alcohol of the formula $C_{10}H_{18}O$, identical in all its properties with rhodinol from oil of roses, has now been also obtained from oil of pelargonium by P. Monnet and P. Barbier. According to V. Markovnikoff and A. Reformatsky, however, the principal constituent of the elæoptene of pure Turkish rose oil is not rhodinol, as stated by Eckart and others, but an unsaturated normal alcohol of the formula $C_{10}H_{20}O$, for which the name "roseol" is proposed. J. Bertram and E. Gildemeister, on the other hand, find that the odorous principle of rose oil is geraniol, and that the products named rhodinol and roseol, and likewise Barbier's licarhodol, are not definite individual compounds, but consist of more or less impure geraniol. In the entire absence of impurities, geraniol is stated by Schimmel & Co. to have a pure and very fine odour of roses, and to be very liable to oxidation on exposure to air. The name "lemonol" is now proposed by P. Barbier and L. Bouveault for the alcohol contained in the essential oil of *Andropogon schœnanthus*, for which the name geraniol is no longer applicable. This oil is found to differ essentially from that of pelargonium. The constituents of eucalyptus oils are described by G. Bouchardat and M. Oliviero, and also by E. Spizzichino; those of the oil of ylang-ylang by A. Reychler; those of oil of hops by A. C. Chapman; and those of the oil of *Erigeron canadense* by F. W. Meissner.

The presence of a diastatic ferment in green leaves, which has been called in question by Wortmann, is confirmed by S. N. Vines. The occurrence of myrosin in *Carica papaya* and other species of the same genus, and likewise in a number of plants belonging to the *Capparidaceæ* and *Tropæolaceæ*, is reported upon by L. Guignard. A ferment resembling emulsin has been observed by E. Gérard in *Pencillium glaucum*. The localization of vegetable enzymes forms the subject of an essay by J. R. Green. The action of papaïn as a digestive ferment has been further investigated by G. Sharp, M. Sittman, D. B. Dott, S. Rideal, and M. Hobein, but the results

exhibit considerable differences with regard to the relative power of this body as a solvent of albumen, and the nature of the products formed during this process of digestion. The discrepancies alluded to appear to be attributable to a want of uniformity of the papaïn experimented with, and to the use of different relative proportions of water, proteïd, and ferment. A modified method for the valuation of pepsin is recommended by E. H. Bartley. The influence of chlorôform on gastric digestion has been studied by M. Dubs, who finds that small quantities of this substance have a favourable rather than a disturbing action on this process, while larger proportions interfere with it on account of the precipitation of pepsin caused by them. The extent of the retarding effect on gastric digestion caused by tea and coffee has been determined by C. Schultz-Schultzenstein.

In a report on choline, neurine, muscarine, and allied compounds, E. Schmidt points out that apparently slight differences in the chemical constitution of these bodies are accompanied by essential differences in their action upon the animal organism, and endeavours to throw light on the nature of the relation between their constitution and physiological effects. Experiments in this direction are still in progress. M. Krüger deals with the constitution of hypoxanthine and adenine, while G. Salomon directs attention to a new xanthine-like body, episarkine, occurring in the urine of leucæmic patients, and in that of pigs and oxen. A characteristic and highly toxic ptomaine has been isolated by A. B. Griffiths from the urine of cancer patients, and two other new ptomaines are reported upon by A. Garcia and C. Lepierre respectively.

The yellow coloration occasionally observed when urine is tested for albumen with a few drops of potassium ferrocyanide solution in the presence of a large proportion of acetic acid, is shown by J. P. Karplus to be due to the presence of nitrites, which may therefore be conveniently detected in a sample of decolorized urine by means of this reaction. A slight modification is proposed by E. Spiegler in the very delicate test for albumen described by him a short time ago. A new test for the detection of glucose in urine, introduced by A. Jaworowsky, is based on the reduction of an alkaline iodate, and the subsequent production of iodide of nitrogen by the careful addition of ammonia to the acidified liquid. N. Wender avails himself of the decolorising action of glucose on methylene-blue for its detection and quantitative estimation. The action of iodine on alkaline solutions of uric acid forms the basis of

a volumetric process proposed by I. Kreidl for the determination of this acid. Methods for the estimation of urobilin, and for the detection of mercury, chloroform, and piperazine in urine will also be found in this volume.

An improvement in the permanganate process for the estimation of tannin is recommended by P. Sisley, and consists in the precipitation of the tannin as zinc tannate and the subsequent oxidation of the latter by means of permanganate. A modification of Kubel's permanganate method for the determination of organic matter in potable water is described by P. E. Alessandri. The volumetric estimation of chlorides in water analysis is shown by W. G. Young to involve a source of error due to the slight solubility of silver chromate, which may be obviated by previous concentration of the water to a small volume. Two new processes are proposed by M. Gröger and D. S. Macnair for the quantitative separation of iodine from chlorine and bromine. One of these depends on the conversion of alkaline iodides into iodates by potassium permanganate, which has no action on bromides or chlorides; while the other is based on the fact that, by treatment with potassium bichromate and strong sulphuric acid, silver iodide is completely converted into iodate, whereas silver chloride and bromide are changed to sulphate. The formation of coloured oxidation products by the action, upon an acid solution of aniline, of chlorine liberated by means of potassium permanganate and sulphuric acid, serves as the basis of a convenient and expeditious test, devised by A. Villiers and M. Fayolle, for the detection of traces of chlorides in the presence of iodides and bromides. Reporting upon the volumetric estimation of hydrocyanic acid, G. Gregor gives preference to Volhard's method over those of Liebig, Mohr, and others, which he finds to give higher numbers and to be therefore less exact than the gravimetric test. As regards Liebig's process, we beg leave to disagree with this statement, and to suggest that the higher numbers referred to are probably attributable to the use of an excess of alkali. For the detection of hydrocyanic acid in presence of ferrocyanides, W. Autenrieth effects the separation of the former by distillation with a large excess of sodium bicarbonate. The suitability of borax for acidimetric titrations is confirmed by T. Salzer, who shows under what conditions the best results may be obtained. The injurious influence of nitric or nitro-hydrochloric acid on the accuracy of sulphuric acid estimations is denied by P. E. Browning, whose results seem to demonstrate that the presence of either of these

acids to the extent of 10 per cent. of the volume of the liquid is beneficial rather than otherwise. A. Gunn proposes a solution of ferrous phosphate in an excess of phosphoric acid as a suitable reagent for the detection and colorimetric estimation of oxalic acid. The determination of phosphoric acid as magnesium pyrophosphate is shown by H. Neubauer to be liable to give fallacious results unless the precipitation of the ammonio-magnesium phosphate is conducted under conditions ensuring the formation of the normal salt. New methods for the volumetric estimation of phosphoric acid are published by H. Pemberton and A. F. Holleman. In a further report on the separation of barium, strontium, and calcium, R. Fresenius deals with the detection of small quantities of any one of these metals in the presence of large quantities of the others. Conditions under which the sulphocyanide test for iron may fail are pointed out by H. Schulze, while certain precautions in the determination of ammonia, rendered necessary by the presence of cyanides or sulphides, are referred to by E. Henry. P. E. Browning proposes a modification of the iodide process for the quantitative separation of copper and cadmium; J. Laborde suggests the use of a standardized solution of stannous chloride for the titration of mercury; and R. Warington gives directions for ascertaining the proportion of lead in tartaric and citric acids. The reaction between alkaline cyanides and silver nitrate, if carried out in the presence of ammonia and with potassium iodide as an indicator, is stated by G. Dénigès to afford a very exact method for the determination of silver. A volumetric process for the estimation of arsenic and antimony suggested by S. Györy is based on the complete conversion of arsenious and antimonious oxides into the corresponding pentoxides by the action of potassium bromate. Referring to the detection of arsenic in bismuth and antimony salts, J. C. Umney speaks very favourably of Bettendorf's test in its original form, but points out the unsuitability of the modification of this reaction adopted in these instances in the recent edition of the United States Pharmacopœia. Determinations of arsenic in commercial samples of glycerin by B. H. Paul and A. J. Cownley show that the amount of this contamination is now very much less than it was at the time when attention was first directed to its occurrence. Notices of a number of contributions to the literature of food and drink adulteration will also be found in this volume.

Two kinds of spurious sarsaparilla have lately occurred in the market, and are described by C. Hartwich and H. G. Greenish

respectively. One of these appears to be the produce of a species of *Philodendron*, while the other proves to be the rhizome of a (probably polypodiaceous) fern. A sample of false jalap, consisting of five pieces and representing no less than three distinct roots, is likewise reported upon by H. G. Greenish. The same author also calls attention to an adulteration of white hellebore with the rhizome and roots of *Asphodelus albus*. A. Andrée gives an account of a spurious senega, differing from the genuine drug in being harder, more fibrous, and almost entirely devoid of the characteristic keel, and containing also a probably accidental admixture of undulated ipecacuanha root. Two samples of ipecacuanha examined by J. Attfield were found to consist of about two-thirds of the official drug and one-third of ipecacuanha stems, and to contain a rather smaller proportion of alkaloid in the stems than in the roots. With regard to the assay of ipecacuanha, he recommends the adoption of certain precautions and of a uniform method, but points out at the same time that, in future, the percentage of "emetine" may not be the only guide for judging the therapeutic value of this drug. Processes for this assay are also suggested by C. C. Keller, A. Grandval and H. Lajoux. B. H. Paul and A. J. Cownley are engaged in a re-investigation of the chemistry of ipecacuanha, and have issued a preliminary report showing that the alkaloid existing in this root is for the most part a perfectly amorphous substance of marked alkalinity, but that this is associated with one or more distinctly crystalline bases differing essentially from the amorphous one in being very much less soluble in ether, chloroform and benzol. The total amount of alkaloid in various samples of the root is found by them not to deviate much from 2 per cent., while that in the stem appears to vary from 1 to 1·8 per cent. In Carthagena ipecacuanha they have discovered, in addition to a considerable amount of the amorphous alkaloid, some proportion of another crystallizable base, presenting marked differences from the crystalline alkaloid of the Brazilian drug. C. Hartwich describes two varieties of the Carthagena drug, presenting structural differences, while J. Moeller observes that Rio and Carthagena ipecacuanha can be readily distinguished from one another by the difference in the size of their starch grains, and that the "striated" ipecacuanha with dense wood and sugary cortex differs from the Carthagena drug only in containing sugar instead of starch. The false Indian ipecacuanha is believed by him to be the rhizome of a plant belonging to the *Aroideæ*. The detection of an adulteration of

ginger with exhausted ginger forms the subject of a report by A. H. Allen and C. G. Moor. A sample of spurious matico examined by H. G. Greenish is shown to be the produce of a *Piper* closely allied to but differing from *P. angustifolium*. A "false senna" referred to by the same author appears to be identical with a kind of jaborandi from Maranham subsequently reported upon by T. H. Wardleworth, and has been identified by the Kew authorities as the produce of a new and distinct species of *Pilocarpus*, which Stapf proposes to name *P. microphyllus*. The alkaloid obtained from it by Conroy seems to possess all the chemical properties of pilocarpine. Another new kind of jaborandi obtained from Ceará is described by E. M. Holmes, and is shown to emanate from a hitherto undescribed species for which the name *Pilocarpus trachylophus* is suggested. The frequent adulteration of kousso with unexpanded male flowers is pointed out by A. Meyer and H. Sandlund; the purity of saffron and of Goa powder is discussed by J. Barclay and E. J. Millard respectively; and two new processes for the detection of gurjun oil as an adulterant in copaiba are proposed by E. Hirschsohn.

A physiological examination of different species of digitalis by M. Goldenberg shows that they all agree in the manner of their influence on the heart, though they differ in the energy of their action, some of them being much less and others more active than *Digitalis purpurea*. The seeds appear to possess greater, and the stems less activity than the leaves. The relative alkaloidal value of different parts of *Datura Stramonium* and *Hyoscyamus niger* has been investigated by L. Dohme. The merits of cocillana, a drug obtained from a species of *Guarea* reputed to possess expectorant properties, have been studied by H. H. Rusby, W. Coblentz, and R. W. Wilcox, who claim that, in diseases of the respiratory organs, this drug is superior to apomorphine, preferable to ipecacuanha, and safer than pilocarpine. Attention is called by D. McAlpine to the poisonous action of *Homeria collina*, a bulbous plant indigenous to the Cape of Good Hope and belonging to the order *Iridaceæ*. O. Hesse reports upon the flowers of *Tagetes glandulifera*, an Argentine member of the order *Compositæ* possessing toxic properties and enjoying a local reputation as a stomachic, aperient, diaphoretic and diuretic. E. Collin refers to the powerful stimulating and tonic action of *Catha edulis* on the nervous system, and gives an account of the cultivation and microscopical structure of this plant. A structural study of Canella bark has been carried out by H. G. Greenish, and the

same service has been performed with regard to cinnamon and cassia barks by R. Pfister. Information respecting the bark of a new species of *Cascarilla* from Columbia is furnished by A. W. Southall in conjunction with C. E. Robinson. The West African drug previously alluded to under the name of Salikounda beans is now shown by E. Heckel and F. Schlagdenhauffen to be the produce of a species of *Copaifera*, which appears to be more nearly allied to the Central American than to the known African species of this genus, and to be also distinct from the species yielding the African copaiba described a short time ago by J. C. Umney. The beans are found to contain coumarin. The collection of Mecca balsam from the twigs of *Commiphora opobalsamum*, and the botanical source of myrrh, are discussed by G. Schweinfurth, who states that the latter is not derived from *Balsamodendron myrrha*, but can be yielded only by *Commiphora abyssinica* or *C. Schimperi*. An East African gum resembling tragacanth is described by C. Hartwich, and is supposed to be produced by a species of *Sterculia*. Galbanum as now occurring in commerce is found by E. Hirschsohn to differ from the drug of former times in being softer in consistence and differently acted upon by solvents. According to A. Conrady, it contains in addition to free umbelliferone a large proportion of this principle in combination with a resin alcohol.

A very considerable number of vegetable drugs have been investigated during the past year with special reference to their constituents. Mexican valerian, a variety of *Valeriana officinalis*, has been examined by R. McLaughlin, and is found to afford indications of a crystalline glucoside, and of a much larger proportion of volatile oil than that occurring in the European variety. The rhizome of *Aconitum septentrionale* has yielded to H. V. Rosendahl three distinct bases, which are described under the respective names of lappaconitine, septentrionaline, and cynoctonine. Small quantities of an alkaloid and of a glucoside have been obtained from the bulbs of *Narcissus orientalis* by L. Robechek. The isolation of a fourth alkaloid, corybulbine, from the root of *Corydalis cava*, is announced by M. Freund and W. Josephy. In a report on *Scilla maritima* (*Urginea Scilla*), S. Waliszewski augments the results of his previous researches, and now claims to have established the presence of four distinct bitter, crystallizable principles. The occurrence of potassium myronate in horse-radish is pointed out by G. Sani. A series of chemical and pharmaceutical notes on rhubarb by B. S. Proctor,

and an account of the cultivation of this drug and of henbane by R. Usher, are published in papers read before the recent meeting of the British Pharmaceutical Conference. In another contribution to the same meeting, W. A. H. Naylor communicates the results of a chemical examination of the herb of *Leonurus cardiaca*, while E. M. Holmes gives a brief historical sketch of this plant as a medicinal agent. An examination of the root and leaves of *Abrus precatorius* by D. Hooper, shows that the latter contain a larger proportion of glycyrrhizin than that occurring in liquorice root, and that the chief constituent of the root is a resin acid amounting to about 8 per cent. The presence of crystallizable glucosidal principles in the root bark of *Chionanthus virginica* and in the leaves of *Piptocalyx moorei*, a plant recently described by E. M. Holmes, has been recognised by W. v. Schulz and J. C. Umney respectively. H. and C. G. Santesson have established the presence of brucine and the absence of strychnine in a bark derived from a Malayan species of *Strychnos*, used in the preparation of "ipoh arrow poison." Notices of reports on this and other arrow poisons by R. Stockman, T. W. Thiselton Dyer, and E. M. Holmes will be found in this volume. F. Ransom has examined the seeds of *Strychnos Ignatia*, which he finds to contain variable proportions of strychnine, brucine, and apparently also of loganin; but he does not regard this drug as a likely rival to *nux vomica* for medicinal purposes, though it may prove useful for the preparation of strychnine. An investigation of the constituents of kousso leads M. Leichsenring to the conclusion that kosin is not a principle pre-existing in these flowers, but that it is a decomposition product of a very active, amorphous constituent, for which he proposes the name "kosotoxin," and which appears to be associated in the drug with an inert body termed by him "protokosin." Betaïne and choline are reported by E. Jahns to occur in addition to santonin in wormseed from *Artemisia gallica*. The seeds of *Jatropha curcas* are stated by A. Siegel to contain a toxalbumen analogous to ricin. A recent investigation of kamala by A. G. Perkin shows that rottlerin is accompanied therein by five other constituents. The so-called "kamaline" of commerce is found by P. Bartolotti to be nothing but rottlerin. In a further report on the tanno-resinous exudation from *Spermolepis gummifera*, E. Heckel and F. Schlagdenhauffen propose that the name of the plant should be changed to *Spermolepis tannifera*, since they have ascertained that the exudation contains nearly 80 per cent. of gallo-tannic acid, close upon 20 per cent. of

tanno-resin, and mere traces of gum, etc. The necessarily limited space of this preface compels us to abstain from alluding to numerous other vegetable drugs which have also been investigated during the past year, and have met with notices in this volume.

Potassium permanganate has proved a successful antidote to phosphorus, muscarine, strychnine, colchicine, oil of savin, and oxalic acid, and is found by F. Schlagdenhauffen and E. Reeb to be equally efficient for counteracting the effects of coronillin, the toxic principle of *Coronilla scorpioides*. Its value as an antidote to hydrocyanic acid and cyanides is confirmed by J. Kossa. An interesting account of the antagonistic action of potassium and calcium salts is given by S. Ringer and H. Sainsbury. Confirmatory evidence is offered by J. Gordon of the powerful solvent action of piperazine on uric acid and its suitability as a therapeutic agent in the treatment of uric acid diathesis and calculus. Paraform (a polymerised formic aldehyde), and, more particularly, bismuth compounds of tribromophenol and beta-naphthol have been introduced as valuable intestinal antiseptics, while the cresols are favourably discussed as general antiseptics and disinfectants. The curative action of inorganic iron salts in chlorosis is dealt with by R. Stockman, who regards their well-established efficiency as due, not merely to their stimulating properties, but mainly to the absorption of the iron, and rejects the theory advanced by Bunge, Mörner, and others as to the cause of their activity. Two new organic iron compounds recommended as blood tonics are described under the respective names of "ferratin" and "sanguinal." The list of synthetic remedies has again received a number of additions during the past year, to some of which we may briefly allude in this place. "Asaprol" (a calcium compound of the sulphonic ether of β-naphthol), "malakin" (a salicyl derivative of paraphenetidin), "alphol" (a salicylic ether of α-naphthol), and "thermodin" (acetyl-para-ethoxyphenyl urethane) are introduced as new antipyretics and antirheumatics; whereas "neurodin" (acetyl-para-oxyphenyl urethane) is stated to possess marked anti-neuralgic properties. Paravalerylphenetidin is brought forward under the name "sedatin" as a useful sedative. "Nasrol" and "lycetol" are both recommended as efficient diuretics, the former of which appears to be sulpho-caffeinate of sodium, while the latter is represented as dimethylpiperazine, and is reported to possess at least as great a solvent action on uric acid as piperazine, and hence to be valuable for the relief of gout.

W. A. H. Naylor proposes an improved formula for the preparation of liquid belladonna plaster as the outcome of further experiments conducted by him on this subject. With regard to chloroform of belladonna, he agrees with P. W. Squire in regarding the B.P.C. process as a wasteful one, involving the loss of a large proportion of alkaloid. Reporting on the preparation of extract of ergot, C. C. Keller arrives at the conclusion that of the various processes suggested, that of the third edition of the Swiss Pharmacopœia is most on a level with the present state of knowledge respecting this drug. Analyses of commercial samples of extract of poppy by B. H. Paul and A. J. Cownley show considerable variation in the amount of morphine contained in them; and similar results with regard to the proportion of alkaloids in trade specimens of extract of aconite have been obtained by F. Casson. The pure green instead of a yellowish green colour of many commercial samples of ethereal extract of male-fern is attributed by W. Peters to the presence of copper. A method for the preparation of extract of nux vomica, yielding a product much less liable to change than the official extract, is recommended by E. W. Lucas. D. Hooper gives a description of extracts of Indian hemp obtained from various sources, and also deals with the preparation of the official extract from different varieties of ganja, as well as with its composition and the examination of commercial specimens. Further propositions for the preservation of syrup of iodide of iron are made by M. Roussillon and by W. Lyon, while a process for the assay of this syrup is suggested by G. Griggi. The sterilization of infusions has engaged the attention of E. White. A report on the stability of tinctures by E. H. Farr and R. Wright forms a fitting sequel to the classical work done by these investigators in connection with the preparation and standardization of these products, and shows that most of the tinctures previously reported upon by them may be preserved under normal conditions without suffering any material loss of active principles. The recovery of residual tinctures from marcs forms the subject of a paper by R. H. Parker, who also submits suggestions for the preparation of phosphorus pills. Notices of reports on the keeping qualities of spirit of nitrous ether, on the preparation of some of the official pill masses, liniments, ointments and oleates, on a suitable soap basis for liniments, on cocoanut stearin as a basis for suppositories, on various pill-coatings and excipients, and on a number of other subjects connected with practical pharmacy will likewise be found in this volume.

CHEMISTRY.

YEAR-BOOK OF PHARMACY.

PART I.

CHEMISTRY.

Preparation of Hydrogen. J. Ball. (*Chem. News*, lxviii. 184.) Attention is called by the author to the observation that the addition of a few drops of solution of cobalt nitrate to the acid and zinc in a hydrogen apparatus causes a very great acceleration in the development of the gas. Nickel salts are found to act in the same manner.

Preparation of Oxygen for Medicinal Purposes. M. Delamotte. (*Répertoire* [3], vi. 54.) The process recommended by the author consists in the gradual addition of small successive quantities of water to sodium peroxide mixed with an equal weight of sand. A steady current of pure oxygen is thus obtained.

Manufacture of Oxygen. G. Kassner. (*Chem. Zeitung*, xvii. 1242.) The author recommends the use of calcium plumbate, $Ca_2 Pb O_4$, in a porous condition, as a means for obtaining a cheap supply of oxygen from the air. For this purpose the plumbate is moistened with steam and subjected to the action of washed furnace gases at a temperature below 100° C. A rapid absorption of carbon dioxide takes place, and calcium carbonate and lead peroxide are formed. On heating the resulting mixture to redness in a retort oxygen is liberated, the evolution of which is facilitated by the introduction of a current of steam. As soon as oxygen ceases to be given off the temperature is raised, and the carbon dioxide now liberated is absorbed by calcium plumbate. The residue in the retort is reconverted into calcium plumbate by means of a current of air and used again as before.

Formation of Ozone at High Temperatures. O. Brunck. (*Ber. der deutsch. chem. Ges.*, xxvi. 1790–1794.) It is well

known that when oxygen is prepared by heating a mixture of potassium chlorate and manganese dioxide, the resulting gas has a strong odour of chlorine, and is generally supposed to contain an appreciable quantity of the latter. The author doubts that the gas with which the oxygen is thus contaminated is really chlorine, as he has been unable to detect any alkalinity or the presence of potassium permanganate in the residue, one or the other of which ought to have been recognisable therein if the mixture had parted with any chlorine. The evolved gas, moreover, was still found to have the power of liberating iodine from potassium iodide after washing with potash. It was also found to oxidize alcohol to aldehyde, but to lose its odour and oxidizing properties by being passed over a short layer of manganese dioxide. From these and other experiments described in the paper the author concludes that it is ozone, and not chlorine, to which the odour of this impure oxygen is due.

Note on the Liberation of Chlorine during the Heating of a Mixture of Potassium Chlorate and Manganese Dioxide. H. McLeod. (*Proc. Chem. Soc.*, No. 133.) In 1889 the author suggested an explanation of the catalytic action which takes place when an "oxygen mixture" is heated, an essential feature in the explanation being the evolution of a small quantity of chlorine. More recently O. Brunck published in the *Berichte* (see preceding abstract) a statement that the gas evolved together with oxygen is not chlorine but ozone.

The author has made several experiments to endeavour to solve the question. A mixture of potassium chlorate and manganese dioxide was heated in a test-tube by means of the vapour of boiling mercury, and the evolved gas was passed through a U-tube filled with small glass beads to remove any potassium chloride carried over mechanically, and then through another U-tube containing an ammoniacal solution of argentic nitrate. On subsequently acidifying the solution with nitric acid, argentic chloride was precipitated. The quantity of chlorine calculated from the amount of the precipitate was not dissimilar from the quantity given in the previous paper.

On extracting the residue with water, filtering and adding litmus solution, the liquid was found to be slightly alkaline. The alkalinity was determined by means of a centinormal solution of oxalic acid, and was found to correspond fairly well with the quantity of chlorine in the argentic chloride.

One test only was made for the presence of ozone in the gas.

The beads in the first U-tube were moistened with a strong solution of potassium iodide, the mixture was heated as before in mercury vapour, and no coloration was seen on acidifying the potassium iodide solution, indicating that under the conditions of the experiment ozone was not produced.

The Alleged Occurrence of Hydrogen Peroxide and of Ozone in the Air. L. Ilosvay de N. Ilosva. (*Ber. der deutsch. chem. Ges.*, xxvii. 920–925.) The author replies to Schöne's observations on this subject, and maintains that no satisfactory evidence has yet been brought forward to warrant the conclusion that hydrogen peroxide and ozone are present in the air or in rain-water. He points out that the usual reagents employed for the detection of these substances are affected in precisely the same manner by nitrogen peroxide, which has been proved to be a constant constituent of the atmosphere. Only negative results are obtained with air from which the latter (NO_2) has been removed. The reagent preferred by the author for the detection of ozone is benzolsulphonic acid-α-azonaphthylamine; while for the detection of hydrogen peroxide, he gives preference over all others to solution of titanic acid in strong sulphuric acid, and next in order to chromic acid ether.

Action of Sodium on Water. M. Rosenfeld. (*Journ. prakt. Chem.* [2], xlviii. 599–601.) The author considers that the explosion which occurs when water is poured upon metallic sodium is due to the formation and immediate decomposition of sodium hydride. The explanation that sodium peroxide is formed, the immediate decomposition of which gives rise to the formation of an explosive mixture of hydrogen and oxygen, is rejected by him on the ground that no oxygen can be detected in the gas obtained by passing steam over sodium.

Purification of Hydrogen Peroxide Solutions. H. P. Talbot and H. R. Moody. (*Journ. für analyt. Chem.*, vi. 650–661.) Commercial hydrogen peroxide solution is mixed with 10 per cent. alcohol and sufficient powdered barium hydrate to produce a distinctly alkaline reaction. The mixture is then filtered, the filtrate treated with a slight excess of sulphuric acid, again filtered, and the alcohol removed from the filtrate by distillation under reduced pressure. For many purposes it suffices to neutralize the commercial preparation with potash, and after allowing to settle, to decant and filter the liquid, and to mix the product quickly with about $\frac{1}{2}$ per cent. of sulphuric acid in order to prevent decomposition. Commercial solutions of peroxide of hydrogen are never pure

enough for use in analysis, as they are liable to contain sulphuric, hydrochloric, phosphoric, and hydrofluosilicic acids, as well as barium, calcium, aluminium, magnesium, sugar, and glycerin.

Action of Ammonia on Sodium Peroxide. MM. Michel and Grandmougin. (*Chemist and Druggist*, May 26th, 1894.) When sodium peroxide is treated with dry ammonia gas it first turns yellow, and parts with a small quantity of oxygen. It then fuses, becomes brown, and froths up, giving off at the same time large volumes of practically pure nitrogen. Caustic soda, sodium nitrite, and nitrate are found in the residue, but the main reaction seems to take place in accordance with the following equation:—

$$2\,NH_3 + 3\,Na_2O_2 = 6\,NaHO + N_2.$$

The authors have also studied the action of ammonia on other peroxides. With the barium compound no nitrite or nitrate is produced; manganese peroxide is reduced to Mn_2O_3 with liberation of nitrogen and water; and in the case of lead peroxide, ammonium nitrate and nitrite are formed, and nitrous fumes are given off.

Preparation of Phosphorus by means of Aluminium. A. Rossel. (*Bull. de la Soc. Chim.*, 3, xii. No. 5.) Phosphorus is liberated when powdered calcium phosphate is heated with aluminium to redness. In the case of bone ash the reaction is attended with incandescence. A mixture of ignited superphosphate with silica and aluminium in powder explodes at a dull red heat.

Crystalline Nature of Red Phosphorus. J. W. Retgers. (*Zeit. anorg. Chem.*, iii. 399–403.) A careful examination of red phosphorus by means of the polarization microscope in a highly refractive medium, such as methylene iodide, has convinced the author that this body is not amorphous, as is generally supposed, but crystalline. The crystalline system has not been determined, for although a few short prisms were observed, there were no rectilinear edges from which the system could be deduced.

Red Phosphorus. W. Muthmann. (*Zeit. anorg. Chem.*, iv. 303, 304.) Referring to Retgers' observation (preceding abstract), the author states that red phosphorus is dimorphous, and that the commercial product is generally a mixture of the crystalline and the amorphous forms, which can to some extent be separated from each other by sublimation in a current of carbonic anhydride.

Occurrence of Selenium Chloride in Hydrochloric Acid. J. E. Gerock. (*Journ. de Pharm. von Els. Lothr.*, 177.) According to the author, this impurity is of frequent occurrence in hydrochloric acid, and often gives rise to a very destructive action of

the latter upon copper vessels, owing probably to its acting as a carrier of chlorine.

Hydrates of Hydrobromic Acid. S. U. Pickering. (*Phil. Mag.* [5], xxxvi. 111.) In addition to the dihydrate already known, the author has now obtained a trihydrate and a tetrahydrate, both in a crystalline condition. The former of these two melts at $-48°$, and the latter at $-55{\cdot}8°$ C. He regards the existence of a pentahydrate as probable.

Hydrates of Hydriodic Acid. S. U. Pickering. (*Ber. der deutsch. chem. Ges.*, xxvi. 2307-2310.) The author has obtained three distinct hydrates of hydriodic acid,—viz., *dihydrate*, $HI, 2H_2O$; *trihydrate*, $HI, 3H_2O$; and *tetrahydrate*, $HI, 4H_2O$,—all of which are crystallizable. The first of these fuses at $-43°$, the next at $-48°$, and the last at $-36{\cdot}5°$ C. A further description of these will be found in the original paper.

Action of Dry Ammonia on Dry Carbonic Anhydride. R. E. Hughes and F. Soddy. (*Chemical News*, lxix. 138, 139.) The authors find that no action whatever takes place when carbonic anhydride and ammonia gas, both in an absolutely anhydrous condition, are mixed together.

Action of Sulphuric Acid on Wood Charcoal. A. Verneuil. (*Comptes Rendus*, cxviii. 195-198.) When wood charcoal is heated with strong sulphuric acid in a flask at 280-300° C., sulphurous and carbonic anhydrides are given off, and the residue contains, together with other acids which are under investigation, mellitic acid and benzenepentacarboxylic acid identical with that obtained by Friedel by the oxidation of pentamethylbenzene.

A New Sulphide of Carbon. B. v. Lengyel. (*Ber. der deutsch. chem. Ges.*, xxvi. 2960-2968.) A compound of the formula C_3S_2 has been obtained by the author in the form of a dark-red liquid of 1·2739 specific gravity, having a very strong characteristic odour, and giving off a vapour producing a very irritating effect on the eyes and mucous membranes. It is insoluble in water, but readily soluble in alcohol, ether, chloroform, benzol, and bisulphide of carbon; when slowly heated, it is converted into a black solid modification, having the same percentage composition; but if the heating is effected rapidly, the same change takes place suddenly, and a violent explosion results. It burns with a smoky flame, yielding carbonic and sulphurous anhydrides. It is produced by the action of an electric current on the vapour of carbon bisulphide. Full details as to the mode of its preparation and purification are given in the paper.

Iodide of Nitrogen. J. Szuhay. (*Ber. der deutsch. chem. Ges.*, xxvi. 1933–1945.) The product of the action of solution of ammonia on strong solution of iodine in potassium iodide does not correspond to the formula NI_3, but to NHI_2. The reaction is represented as occurring in accordance with the following equation:—

$$3NH_3 + 4I = 2NH_4I + NHI_2.$$

Details respecting the mode of analysis are given.

A corresponding silver compound of the formula $NAgI_2$ is obtained by treating nitrogen iodide, suspended in water, with ammoniacal solution of silver nitrate. It is a black amorphous substance, which explodes on drying and heating. When boiled with water or dilute acids, it splits up into silver iodide, iodine, and nitrogen.

Volatility of Ammonium Chloride at 100° C. K. Kraut. (*Zeitschr. anorg. Chem.*, v. 278.) The author finds that prolonged heating of ammonium chloride in a platinum dish at 100° C. causes a very appreciable and continuously increasing loss by volatilization.

Preliminary Note on the Volatilization of Salts during Evaporation. G. H. Bailey. (*Proc. Chem. Soc.*, No. 137.) From experiments, carried out for the most part with the chlorides of the alkali metals, it was found that an appreciable amount of the salt was lost during evaporation of the aqueous solutions, although every precaution was used to prevent this occurring mechanically.

The amount of loss was found to be greater with the haloid compound of elements of higher atomic weight, and also greater the more concentrated the solution.

With lithium chloride of about one-fifth normal strength, it amounted to 0·35 milligrams per litre of water evaporated, and with calcium chloride of the same strength, 2·4 milligrams; whilst with lithium chloride containing about 38 grams to the litre, the loss was 2·45 milligrams, and with cæsium chloride, containing 286 grams to the litre, it was 18·86 milligrams.

The observations also reveal a source of error which, in the case of some estimations, will involve the making of a large correction, and which must, at all events, receive consideration in all investigations where a high degree of accuracy is of essential importance.

Preparation of Pure Potassium Iodate. M. Gröger. (*Zeitschr. angew. Chem.*, 1894, 13.) This salt may be readily obtained by adding a strong solution of 20 grams of potassium iodide to a

solution of 40 grams of pure potassium permanganate in 1 litre of hot water, then boiling the mixture for about half an hour, and afterwards reducing the excess of permanganate by the careful addition of alcohol. The filtrate is acidified with acetic acid, concentrated by evaporation to about 50 c.c., and allowed to crystallize. After separation from the mother-liquor, the crystals are washed with strong alcohol, and dried.

Action of Ferric Salts on Iodides. K. Seubert and A. Dorrer. (*Zeitschr. für anorg. Chem.*, v. 334-353.) The reaction between ferric chloride and iodides is generally represented by the equation :—

$$Fe_2Cl_6 + 6MI = 2FeI_2 + 6MCl + I_2$$

or

$$Fe_2Cl_6 + 2MI = 2FeCl_2 + 2MCl + I_2.$$

The authors, however, show that neither of these equations fully explains the various changes occurring in this action. While in strong solutions, and with a large excess of iodide, the theoretical quantity of iodine may be liberated, less than this amount, as a general rule, is set free, the quantity in weak solutions showing a considerable deficiency. Exceedingly weak solutions of ferrous chloride even absorb iodine with the formation of some ferric salt. The authors investigated these changes under varying conditions, and describe a number of experiments showing the influence of time and also the influence of the relative mass of the two reagents on the nature of the reaction. Details will be found in the original paper.

Atomic Weight of Barium. T. W. Richards. (*Zeitschr. anorg. Chem.*, vi. 89-127.) The mean result of a series of very careful re-determinations by the author of the atomic weight of barium is given as 137·44.

Constitution of Bleaching Powder. G. Lunge. (*Zeitschr. anorg. Chem.*, iii. 351, 352.) The author replaces the formula $Ca(OH)_2Cl_2$, previously suggested by him, by $CaOCl_2, H_2O$.

Crystallized Normal Magnesium Carbonate. K. Kippenberger. (*Zeitschr. anorg. Chem.*, vi. 177-194.) On treating freshly precipitated carbonate of magnesia, prepared in the usual way, with a cold solution of potassium or sodium bicarbonate, a portion of the precipitate dissolves and the filtered solution deposits crystals of normal magnesium carbonate on standing. The crystals have the composition $4MgCO_3 + 15H_2O$, but they lose the greater part of their water on prolonged exposure to air.

Magnesium Nitride. A. Smits. (*Rec. Trav. Chim.*, xii. 198–202. From *Journ. Chem. Soc.*) Magnesium nitride is prepared by heating magnesium powder in a current of dry ammonia. It is a yellow substance, easily powdered, and must be kept in sealed tubes, as it is rapidly acted on by the moisture of the air. Although immediately decomposed by water, it is not acted on by glycerin or by oxalic acid dissolved in absolute alcohol. Nitrate of silver in alcoholic solution is reduced by it.

A quantitative synthesis establishes the composition Mg_3N_2, a result confirmed by analyses.

Iron Nitride. G. J. Fowler. (*Chem. News*, lxviii. 152.) On heating reduced iron in a rapid current of ammonia, iron nitride, Fe_2N, is obtained as a greyish powder possessing slight magnetic properties. This body, when heated, splits up into its constituents, but it may be heated in nitrogen up to 440° C. without suffering any change. By heating it in hydrogen, steam, or sulphuretted hydrogen, ammonia is formed. Iron nitride is soluble in hydrochloric acid with evolution of hydrogen and formation of ammonium chloride, in accordance with the following equation:—

$$Fe_2N + 5HCl = 2FeCl_2 + NH_4Cl + H.$$

It readily burns in chlorine gas, yielding ferric chloride and nitrogen. Further particulars as to its characters will be found in the original account.

Lead Tetrachloride. H. Friedrich. (*Ber. der deutsch. chem. Ges.*, xxvi. 1434–1436.) Lead tetrachloride, $PbCl_4$, is formed when chlorine gas is passed into hydrochloric acid in which lead dichloride is suspended. On treating the product with ammonium chloride, a double salt of the formula $PbCl_4, 2NH_4Cl$ separates, which is analogous in composition to ammonium stannichloride. If this compound is added to strong sulphuric acid, lead tetrachloride separates as an oily liquid, which may be purified by repeatedly shaking with fresh portions of sulphuric acid. When pure, it is a yellow, semi-transparent, highly refractive liquid, fuming in contact with moist air, and decomposing into lead dichloride and free chlorine. Its specific gravity at 0° C. is 3·18, and at −15° C. it solidifies to a yellow crystalline mass. It can be kept unchanged under cold strong sulphuric acid; but when heated with the latter to 105° C. or beyond, it suddenly decomposes with an explosion. A hydrate can be obtained by the addition of a very small quantity of water; but if more water be added, this hydrate splits up into lead peroxide and hydrochloric acid. A

crystalline product of the formula $PbCl_4$, $2HCl$ is formed when the tetrachloride is treated with a very small quantity of cooled hydrochloric acid.

Antimony-Blue. G. Sebor. (*Journ. Chem. Soc.*, 1894, from *Chem. Centr.*, 1893, ii. 318, 319.) Antimony-blue is prepared by dissolving antimony sulphide in concentrated hydrochloric acid, and, after filtering, adding to the boiling liquid a concentrated solution of potassium ferrocyanide and some potassium chlorate or nitric acid; the precipitate is dried at 100°. An antimony-blue is also obtained by mixing antimony chloride and potassium ferrocyanide, and adding a large quantity of water. When prepared in this way, it contains some basic antimony chloride. A sample of pure antimony-blue gave, on analysis, Fe=30·28, Sb=2·422, H_2O=5·828, Cl=0·712, O=0·323, and CN=60·435 per cent. The blue is insoluble in cold hydrochloric, sulphuric, and nitric acids; when boiled with hydrochloric or sulphuric acid, it yields hydrocyanic acid. Dilute sodium and potassium hydrates and ammonia only attack it when warmed. When heated with nitric acid, it is converted into a greyish-green compound. Unlike Prussian-blue, it is not soluble in a solution of an oxalate or tartrate.

Instability of Solutions of Mercuric Chloride. E. Burcker. (*Comptes Rendus*, cxviii. 1345.) Solutions of mercuric chloride in pure distilled water, when protected against air and light, keep unaltered, and when exposed to their influence, they are only very slightly and slowly changed. But if natural instead of distilled water be used in preparing the solution, a perceptible decomposition sets in at once, and subsequently increases under the combined action of light and air. The mineral and organic constituents of the water are therefore regarded by the author as the primary cause of the change.

Action of Aluminium on Mercuric Salts. J. Klaudy. (*Chem. Centr.*, i. 1893, 201.) The first product in the reaction between aluminium and an aqueous solution of mercuric chloride is aluminium amalgam, which is subsequently decomposed by the water, aluminium chloride being formed. The action is very energetic if a strong alcoholic instead of an aqueous solution of mercuric chloride is employed, and especially if the mixture is warmed. In this case the alcohol is decomposed towards the end of the reaction, and the aluminium converted into basic chloride. Other mercuric salts are acted upon in the same manner. The amalgam referred to contains $\frac{1}{30}$th of its weight of mercury: it becomes hot on ex-

posure to the air, decolorizes indigo, and reduces solutions of potassium permanganate, ferricyanide, and bichromate.

Action of Mercurous Chloride on Silver Chloride in Presence of Ammonia. U. Antony and G. Turi. (*Gazzetta Chim. Ital.*, xxiii., ii. 231–237. From *Journ. Chem. Soc.*) Pesci has shown that the black precipitate obtained by treating mercurous chloride with ammonia contains metallic mercury; this observation explains the well-known fact that, on adding ammonia to the white precipitate obtained with hydrochloric acid in a mixed solution of silver and mercurous salts, silver is retained in the black precipitate. If the precipitate remains long in contact with ammonia, the reaction represented by the following equation may occur:—

$$4\,HgCl + 4\,AgCl + 8\,NH_3 = 2(NHg_2Cl, NH_4Cl) + 4\,Ag + 4\,NH_4Cl.$$

On repeatedly washing the mixture of silver chloride and mercurous chloride with ammonia solution on a filter, a residue was ultimately obtained which contained 1·16 per cent. of silver, instead of 30 per cent. as indicated by the above equation. When, however, the mixed chlorides precipitated from a solution containing excess of silver salt were digested with ammonia for some time, the resulting precipitate was found to contain the quantity of silver indicated by the equation. During a qualitative analysis, therefore, if silver is not found in the filtrate from this black precipitate, the latter should be examined for the metal.

Gelatinous Silver Cyanide. L. K. Frankel. (*Chemical News*, lxviii. 178.) The author obtained this substance in the form of a transparent gelatinous precipitate, resembling aluminium hydrate, on fusing silver chloride with potassium cyanide, boiling the fused mass with water, and allowing to stand. It was soluble in ammonia, and was reprecipitated from this solution by dilute nitric acid. It did not fuse on heating, but decomposed, leaving a residue of metallic silver. It gave the cyanide reactions, and was free from chlorine, but it contained 5 per cent. less silver than is present in normal silver cyanide.

Mercuric Salicylates. H. Lajoux and A. Grandval. (*Comptes Rendus*, cxvii. 44–47.) Normal mercuric salicylate is obtained in the form of a white powder by precipitating a solution of sodium salicylate with one of mercuric chloride at an ordinary temperature. Upon boiling with water, it is decomposed into salicylic acid and basic mercuric salicylate, $HgC_7H_4O_3$, the latter of which can also be directly prepared from salicylic acid by gradually adding to its boiling aqueous solution an equivalent quantity

of freshly precipitated mercuric oxide, each successive quantity being added when the yellow colour of the preceding portion has disappeared. The product may be freed from adhering acid by washing. Like the normal salt, it is decomposed by heat.

Gallates of Mercury. MM. Brousse and Gay. (*Comptes Rendus*, cxvii. 284.) Mercurous gallate is obtained as a greenish powder from mercurous nitrate by precipitation with gallic acid, and is recommended as an antisyphilitic in doses of 0·1 to 0·2 gram. Mercuric gallate is red when freshly prepared, but becomes brown on drying. It is obtained by treating mercuric acetate with gallic acid.

Basic Gallate of Bismuth. H. Causse. (*Comptes Rendus*, cxvii. 232–234.) This preparation has been recently introduced as a therapeutic agent (see *Year-Book of Pharmacy*, 1893, 212). It forms a yellow powder, but may also be obtained in the form of small lemon-yellow crystals by precipitating a solution of bismuth nitrate with gallic acid in the presence of potassium nitrate and acetic acid. These crystals are unstable towards air and light, dissolve readily in strong acids, and have a composition represented by the formula $C_7H_3O_5Bi, 2H_2O$. A double *gallate of bismuth and magnesium*, $C_7H_3MgBiO_5$, is also described in this paper.

Arsenic in Glycerin. B. H. Paul and A. J. Cownley. (*Pharm. Journ.*, 3rd series, xxiv. 685.) The authors have examined a number of samples of glycerin for arsenic, and find that in regard to the amount of this impurity there has been a great improvement since 1890, when researches of others on the same subject were published. The samples now reported upon by them showed but small traces of arsenic, varying from 1 part in 100,000 to 1 in 1,000,000.

Compounds of Sugars with Iron. F. Evers. (*Ber. der deutsch. chem. Ges.*, xxvii. 474, 475.) The author describes an *iron sucrate*, containing about 48·5 per cent. of iron, and obtained as a crystalline, reddish-brown powder by pouring a solution of cane-sugar and ferric chloride into a slight excess of solution of sodium hydrate. It is almost entirely soluble in a solution of cane-sugar. *Iron maltosate*, containing about 32 per cent. of iron, is obtained in an analogous manner as a brown powder completely soluble in solution of maltose.

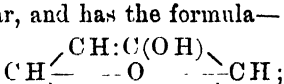
Formation of Hydrocyanic Acid in the Oxidation of Cane-Sugar with Nitric Acid. F. B. Burls. (*Chem. News*, lxviii. 66.) The author has observed that in the preparation of oxalic acid from nitric acid and cane-sugar appreciable quantities of hydrocyanic

acid are produced. Further experiments have led him to infer that this acid is a normal product of the reducing action of certain carbon compounds on nitric or nitrous acid.

The Supposed Inversion of Cane-Sugar in Aqueous Solutions. A. Béchamp. (*Bull. de la Soc. Chim.* [3], ix. 21-27.) In every case where the author found that inversion of cane-sugar had taken place, organisms were present. The organisms concerned in the inversion are not entirely destroyed by boiling the solutions, nor even by the addition of phenol. Ordinary white loaf-sugar gives solutions which show greater inversion than solutions of the purest sugar-candy similarly treated, owing to the small quantities of proteïd and mineral matters contained in the former, favouring the growth of the organisms. The exposure to sunlight of sealed tubes containing samples simply favours the growth of the organisms by raising the temperature of the containing solution.

Trehalose. E. Winterstein. (*Ber. der deutsch. chem. Ges.*, xxvi. 3094-3098.) The molecular weight of trehalose, as determined by both Raoult's and Beckmann's methods, agrees with the formula $C_{12}H_{22}O_{11}$. The author has again investigated the products of the hydrolysis of trehalose, but has been unable to find any other product than glucose.

Maltol. J. Brand. (*Ber. der deutsch. chem. Ges.*, xxvii. 806-810. From *Journ. Chem. Soc.*) Caramel malt, which has recently been introduced into the brewing and malt industry, is prepared by roasting malt which contains a large proportion of water; it differs, therefore, from ordinary malt in possessing a considerably higher percentage of sugar. Beer prepared from caramel malt gives a violet coloration with ferric chloride; this is not due to salicylic acid, but to the presence of a compound termed *maltol*, which is distinguished from salicylic acid by giving no reaction with Millon's reagent. The temperature employed in the manufacture of malt coffee is higher than that used in the preparation of caramel malt, and in this case maltol is formed in larger quantity, and can be isolated from the volatile products in the manner described in the original paper. Maltol readily sublimes, and is deposited in colourless, odourless crystals melting at 159°. It has the characteristic properties of a phenol, does not form an oxime or a phenylhydrazone, reduces silver solutions at ordinary temperatures, and alkaline copper solution on heating. Maltol is probably a condensation product of grape-sugar, and has the formula—



this formula most readily accounts for its properties, and agrees with the analytical results and molecular weight determination.

The Purity of Sugar of Milk. J. O. Braithwaite. (*Pharm. Journ.*, 3rd series, xxiv. 853.) The author has examined a number of commercial samples of sugar of milk with the following results :—

No.	1 gm. boiled with 10 c.c. fresh milk.	Amount of Ash, per cent.	Composition of Ash, per cent.	Percentage of Lactate (Mg. or Ca.) in Ash.	Acidity in Terms of Lactic Acid, per cent.
1	Coagulates.	1·53	1·343 Mg O.	6·78 Mg.	0·018
2	Nil.	0·21	Mg. & Ca.*	—	0·018
3	Nil.	0·32	Fe, Mg, Ca.*	—	0·072
4	Nil.	0·10	Mg.*	—	0·054
5	Nil.	0·09	Mg.*	—	0·036
6	Nil.	0·08	Mg.*	—	0·018
7	Nil.	0·03	Mg.*	—	—
8	Coagulates.	1·6	1·35 Mg O.	6·8 Mg.	—
9	Nil.	0·03	Mg.*	—	0·072
10	Coagulates.	1·16	0·76 Mg O.* 0·22 Ca CO_3.	3·83 Mg. 0·47 Ca.	0·036
11	Nil.	0·02	Mg.*	—	—
12	Coagulates.	1·18	1·36 Mg O.	6·9 Mg.	0·018

It will be noticed that those samples which caused coagulation of caseïn were the same as those yielding an excessive ash. The conclusion is drawn that in the case of these four samples, magnesia or magnesium carbonate had been added in the process of manufacture to neutralize the acidity of the whey during crystallization, with the result that lactate of magnesium crystallized out with the milk-sugar. It was found that the addition of a very small amount of neutral magnesium lactate to fresh milk caused coagulation on boiling, and, further, that a sample of sugar of milk containing an admixture of 5 per cent. of this salt causes immediate and complete coagulation, while the same milk-sugar in the pure state has no action on boiling milk.

It is suggested that in the official tests for the purity of sugar of milk the amount of ash should be directed to be determined, and that this should not be allowed to exceed 0·25 per cent.

The Action of Diastase on Starch. C. J. Lintner and G. Düll. (*Ber. der deutsch. chem. Ges.*, xxvi. 2533–2547.) Five definite compounds are formed by the action of diastase on starch, viz., isomaltose and maltose, and three dextrins, for which the names *amylodextrin*, *erythrodextrin*, and *achroodextrin* are suggested.

* Traces only.

These substances were isolated by treating the solutions with alcohol of various strengths, their purity was determined by means of the refractive power, molecular weight by Raoult's method, and their behaviour towards phenylhydrazine, alkaline copper solution, and iodine, in the manner fully described in the original paper.

Amylodextrin, $(C_{12}H_{20}O_{10})_{54}$, is the first decomposition product of this action, and the chief constituent of "amidulin, soluble starch," etc. The successive stages in the decomposition of this product by the further action of diastase are represented by the following equations :—

$$(C_{12}H_{20}O_{10})_{54} + 3H_2O = 3[(C_{12}H_{20}O_{10})_{17}, C_{12}H_{22}O_{11}].$$
Erythrodextrin.

$$3[(C_{12}H_{20}O_{10})_{17}, C_{12}H_{22}O_{11}] + 6H_2O = 9[(C_{12}H_{20}O_{10})_{5}, C_{12}H_{22}O_{11}].$$
Achroodextrin.

$$9[(C_{12}H_{20}O_{10})_{5}, C_{12}H_{22}O_{11}] + 45H_2O = 54C_{12}H_{22}O_{11} = 54C_{12}H_{22}O_{11}.$$
Isomaltose. Maltose.

Under ordinary circumstances all these changes occur more or less simultaneously.

Combinations of Starch with Iodine. G. Rouvier. (*Comptes Rendus*, cxvii. 281 and 461.) The author has further investigated the products of the action of iodine on starch under varying conditions as regards the relative proportions of these two substances employed. He finds that four definite compounds can be obtained, the composition of which is represented by the following formulæ :—

$$(C_6H_{10}O_5)_{16}I_2.$$
$$(C_6H_{10}O_5)_{16}I_3.$$
$$(C_6H_{10}O_5)_{16}I_4.$$
$$(C_6H_{10}O_5)_{16}I_5.$$

Carbohydrates of the Jerusalem Artichoke. C. Tanret. (*Comptes Rendus*, cxvii. 50–53.) From the juice of Jerusalem artichokes the author has isolated two carbohydrates, *helianthenin* ($12C_6H_{10}O_5 + 3H_2O$) and *synanthrin* ($8C_6H_{10}O_5 + H_2O$), which are much more soluble in alcohol than inulin, pseudoinulin, or inulenin. They are obtained by fractional precipitation with alcohol after the juice has been previously treated with basic acetate of lead, and after removal of the lead with barium hydrate. Both these carbohydrates also occur in the dahlia and in elecampane. A full description of them will be found in the original account.

Suberone. V. Markovnikoff. (*Journ. Russ. Chem. Soc.*, xxv. 364–378 and 547–564.) Suberone easily dissolves in nitric acid of sp. gr. 1·30, but there is no action until the solution is warmed. The only crystalline oxidation product obtained was normal pimelic acid.

The following derivatives of suberone are described: *Suberol* (*Suberylic alcohol*), *Suberoxime*, *Suberylamine*, *Suberene*, and *Suberylene*. Details will be found in the original papers.

Tunicin. E. Winterstein. (*Zeitschr. für physiol. Chem.*, xviii. 43–56.) Tunicin, or animal cellulose, agrees in nearly all its properties with vegetable cellulose. It does not show greater resistance to acids than vegetable cellulose, as Berthelot stated. On hydrolysis, it yielded dextrose, and a small quantity of another sugar, which was not identified. This second sugar is, however, not galactose, mannose, or pentose.

The Preparation of active Amyl Alcohol and active Valeric Acid from Fusel Oil. W. A. C. Rogers. (*Proc. Chem. Soc.*, No. 127.) The author has prepared the alcohol by a modification of Le Bel's method communicated to him by Professor Odling and Mr. Marsh, which consists in heating the alcohol with a fuming aqueous solution of hydrogen chloride in closed tubes at 100°, the treatment being repeated until the rotatory power of the product reached a maximum. Finally, from 16·2 litres of purified fusel oil, he obtained 250 c.c. of an alcohol rotating −8° 30′ per 200 mm. at 22° (or $[\alpha]_D = -5{\cdot}2°$). By oxidizing this alcohol a valeric acid was obtained rotating 26° per 200 mm. at 22° ($[\alpha]_D = 13{\cdot}9°$). The values thus obtained are practically identical with those given by Guye and Chavanne in a recent paper.

Absolute Alcohol. E. R. Squibb. (*Journ. Amer. Chem. Soc.*, xv. 126.) The author has continued his researches on the dehydration of alcohol, and arrives at the conclusion that up to the present time no really anhydrous alcohol has yet been obtained. Particulars of his experiments are given in the paper.

The Decomposition of Chloroform containing Alcohol. D. Brown. (*Pharm. Journ.*, 3rd series, xxiv. 321.) The author demurs to the explanation given by Schacht and Biltz respecting the preservative action of alcohol on chloroform. He understands the statements of these chemists to mean that chlorine and carbonyl chloride are produced in decomposing chloroform containing alcohol, that they are consumed by the latter, harmless compounds being thus formed, and that therefore the primary and hurtful decomposition products named cannot be recognised until all the

alcohol has been used up. His own experience tends to prove that free chlorine and carbonyl chloride, when once produced in chloroform containing alcohol, can be readily detected before the added alcohol has all been consumed, and further, that there is only a very faint reaction with silver nitrate at the time when a very marked one is obtained with zinc iodide and starch. The following experiments were performed:—Samples of pure chloroform to which 0·077 per cent. of absolute alcohol had been added were exposed to sunlight in the presence of air in white glass bottles one-third filled. After nine days' exposure no signs of decomposition could be detected, whereas a sample of the same chloroform, free from alcohol, was found to be far advanced in decomposition. After fourteen days the alcohol-reduced samples reacted distinctly with zinc iodide and starch and faintly with silver nitrate. The exposure was continued for five days longer, when zinc iodide and starch, as well as baryta water, gave marked reactions. A quantity of 10 c.c. was then washed with 10 c.c. of water, and distinct alcohol reactions with the iodoform and Biltz's potassium bichromate tests were obtained. Similar results were also obtained after exposing a sample of specific gravity 1·490 in the presence of oxygen for thirteen days. The presence of alcohol, therefore, does not seem to prevent decomposition in chloroform being recognised in its early stages by both zinc iodide and starch and by baryta water. These tests appear to be of equal value in detecting decomposition in alcohol-reduced chloroform and in the pure unreduced article.

After several days' exposure the samples reduced with 0·077 per cent. of absolute alcohol showed no signs of decomposition, and were found to contain alcohol, while the others were decomposing rapidly, and subsequently gave on analysis 0·348 per cent. of carbonyl chloride, which, if made to react on alcohol to produce chlorocarbonic ether and ethyl chloride, would require a quantity equal to 0·323 per cent. In addition to this there was 1·329 per cent. of free hydrochloric acid, which, if it acted on alcohol to produce ethyl chloride, would decompose an additional quantity equal to 1·674 per cent., or a total of 1·997 per cent. of alcohol. The products obtained from the unreduced samples are thus shown to be capable of consuming twenty-six times the quantity of alcohol added to the reduced ones which remained free from decomposition.

The Purity of Chloroform. D. B. Dott. (*Pharm. Journ.*, 3rd series, xxiv. 629–631.) In view of the well-established preserving influence of a small proportion of alcohol in chloroform, the author

advocates a reduction in the required specific gravity of the latter. For the detection of decomposition in chloroform he suggests the use of moist litmus paper and solution of silver nitrate. The following requirements are recommended as characters and tests for the purity of this preparation :—

A dense liquid of characteristic odour. Specific gravity 1·490 to 1·495. On allowing ½ fl. drm. to evaporate on a clean surface, no foreign odour is perceptible at any stage of the evaporation. When 1 fl. drm. is agitated with an equal volume of solution of silver nitrate, no precipitate or turbidity is produced after standing for five minutes. On shaking up the chloroform with half its volume of distilled water, the water should not redden litmus paper. When shaken with an equal volume of sulphuric acid, little or no colour should be imparted to the acid.

Oxidation of Chloroform with Chromic Acid. H. Erdmann. (*Ber. der deutsch. chem. Ges.*, xxvi. 1990 1994.) The oxidation of chloroform with potassium bichromate and sulphuric acid was studied by Emmerling and Lengyel in 1869. These chemists found but a small amount of carbon oxychloride among the products, and they incorrectly interpreted the reaction, believing that chlorine is formed. The author has reinvestigated this reaction, and finds that it takes place in accordance with the following equation :—

$$2\,CH\,Cl_3 + Cr\,O_3 + 2\,O = 2\,CO\,Cl_2 + Cr\,O_2\,Cl_2 + H_2\,O.$$

Action of Light on Oxalic Acid. A. Richardson. (*Proc. Chem. Soc.*, No. 137.) Downes and Blunt, in 1879, observed that solutions of oxalic acid evolve carbon dioxide when exposed to light. In the present paper the author shows that hydrogen peroxide is also formed. Experiments are described in which this was found to be the case with numerous specimens of oxalic acid obtained from different sources and carefully purified. The presence of the peroxide was proved by the titanic acid and chromic acid tests.

The decomposition of the acid was further studied in order to determine whether complete oxidation of the carbon to carbon dioxide occurred, or whether products of partial oxidation were also formed. The results of experiments in which the carbon dioxide evolved during the decomposition of a known weight of acid was estimated, showed that the oxidation of the carbon was complete.

The absence of intermediate products of oxidation seems to indi-

cate that the formation of the peroxide is the direct result of the oxidation of the hydrogen of the acid, and is not brought about by secondary changes.

Experiments were also made in order to observe the influence of the concentration of the acid on the formation of the peroxide. The results obtained showed that while the total amount of hydrogen peroxide formed in the solution increased with the concentration of the acid, the proportion of peroxide formed to acid decomposed simultaneously decreased. The author draws the following conclusions:—

1. Hydrogen peroxide is stable in solutions of oxalic acid in the dark.

2. It is fairly stable in these solutions when exposed to light if excess of oxygen is present.

3. Rapid decomposition of hydrogen peroxide occurs in solutions of oxalic acid in absence of oxygen when these solutions are exposed to light.

Oxalic Acid Derivatives. A. Rosenheim. (*Ber. der deutsch. chem. Ges.*, xxvi. 1191–1194. From *Journ. Chem. Soc.*) Tungstic anhydride is dissolved when boiled with potassium oxalate solution; after separation from tungstic acid and evaporation, colourless, crystalline plates are deposited; these have the formula $K_2C_2O_4, WO_3 + H_2O$, and are decomposed by hydrochloric acid immediately, and by sulphuric acid more slowly. The corresponding *sodium* and *ammonium* salts resemble the potassium salt, but are more readily soluble.

By the action of molybdic anhydride on ammonium oxalate, two salts are obtained; the more readily soluble, $C_2O_4(NH_4)_2, MoO_3 + H_2O$, can be purified by recrystallization, when it forms lustrous needles. The second salt, $C_2O_4(NH_4)_2, 2MoO_3$, crystallizes in white crusts, and undergoes decomposition on treatment with hot water. A third salt is prepared by the action of hydrogen ammonium oxalate on molybdic anhydride; it crystallizes in prisms, and has the formula—

$$(NH_4)_2O, 2C_2O_3, 2MoO_3, 3H_2O.$$

The preceding compounds may also be obtained from hydrogen ammonium oxalate and hydrogen ammonium molybdate. The corresponding *potassium* and *ammonium sodium salts* are crystalline; the *sodium salts* do not crystallize.

A double *ammonium vanadium oxalate*, $3(NH_4)_2O, 4C_2O_3, V_2O_5, 4H_2O$, crystallizing in long, yellow prisms, is prepared from

ammonium oxalate and vanadic anhydride, or from hydrogen ammonium oxalate and ammonium metavanadate. The corresponding *sodium* and *potassium* salts have also been obtained.

Reduction of Salicylic Acid. A. Einhorn and R. Willstätter. (*Ber. der deutsch. chem. Ges.*, xxvii. 331.) The authors state that one of the products of the reduction of salicylic acid by sodium in amylic alcohol solution, which was previously regarded by them as hexahydrosalicylic acid (melting-point 105° C.), proves to be normal pimelic acid.

Preparation of Urea. A. Reychler. (*Bull. de la Soc. Chim.* [3], ix. 427–429.) A dilute solution of sodium hypochlorite is gradually added to an aqueous solution of potassium cyanide; after the odour of cyanogen compounds has disappeared, an excess of ammonium sulphate is added, the whole heated to the boiling-point, and then evaporated to dryness. The residue is extracted with 94 per cent. alcohol, and yields a crude product containing 89·4 per cent. of the theoretical quantity of carbamide.

If sodium peroxide is used as the oxidizing agent, the yield is only 1·5 grams of carbamide from 10 grams of cyanide. Formamide yields 37·5 per cent. of the calculated amount of carbamide when oxidized by sodium hypochlorite in presence of sodium carbonate and treated as above; no carbamide is obtained, however, if sodium peroxide is substituted for hypochlorite.

Preparation of Piperazine. (*Pharm. Journ.*, 3rd series, xxiv. 2.) When this body is prepared by the reaction of glycol, $C_2H_4(OH)_2$, with ethylenediamine in accordance with the equation—

$$C_2H_4(OH)_2 + C_2H_4(NH_2)_2 = (C_2H_4NH)_2 + 2H_2O,$$

the yield is very small even if the operation be conducted at a high temperature and under the influence of dehydrating agents. The reaction, however, is complete when sodium glycol is treated with the acid derivatives of ethylenediamine—

$$\left.\begin{matrix} C_2H_4(ONa)_2 \\ C_2H_4(NH\cdot COR')_2 \end{matrix}\right\} = \left\{\begin{matrix} (C_2H_4NH)_2 \\ 2R'COONa. \end{matrix}\right.$$

This process is the subject of a German patent which is now made by the Schering Company.

Synthesis of Pyrazine. L. Wolff. (*Ber. der deutsch. chem. Ges.*, xxvi. 1830–1833.) The gold salt previously obtained by the author from the products formed by heating acetalamine with oxalic acid has now been proved to be a salt of pyrazine, and to have the formula $C_4H_4N_2$, $AuCl_3$. A yield of about 20 per cent.

of the theoretical amount of the base may be obtained from acetalamine by adding 1 part of the latter to a concentrated warm solution of 3 parts of mercuric chloride, and then sufficient concentrated hydrochloric acid to dissolve the double salt which is precipitated. The liquid is then boiled for 10 minutes, filtered, rendered alkaline with anhydrous sodium carbonate, and distilled with steam. The distillate is acidified with hydrochloric acid, distilled to remove alcohol, etc., and the pyrazine then converted into the double salt with mercuric chloride, which is finally distilled with a very concentrated solution of potassium carbonate. The pure base is thus obtained as an oil, which soon solidifies to white needles.

New Synthesis of Isoquinoline. C. Pomeranz. (*Monatshefte*, xiv. 116-119.) Isoquinoline can be synthetically prepared by mixing benzaldehyde with amidoacetal, drying the resulting benzylidine-acetal with potassium carbonate, and then heating it for some time at 100 120° C. with four times its weight of sulphuric acid.

Occurrence of Betaïne and Choline in the Sprouts of Barley and Wheat. E. Schulze and S. Frankfurt. (*Ber. der deutsch. chem. Ges.*, xxvi. 2151 2155. From *Journ. Chem. Soc.*) The authors have succeeded in isolating and identifying betaïne and choline from the sprouts, or young seedlings, of barley (malt combs) and wheat. The method adopted was to extract the sprouts with water, treat the extract with lead acetate, and, after filtering, to precipitate the bases with phosphotungstic acid. The precipitate was then treated with milk of lime, the solution filtered, treated with carbonic anhydride, again filtered, neutralized with hydrochloric acid, and concentrated to a syrup. The hydrochlorides were extracted with hot alcohol, precipitated with an alcoholic solution of mercuric chloride, and the mercurichlorides separated by repeated crystallization from water; or after crystallizing them once or twice, the mercury was removed with hydrogen sulphide, and the hydrochlorides separated by means of cold absolute alcohol, in which choline hydrochloride dissolves, whilst betaïne hydrochloride does not.

Contributions to the Knowledge of the Aconite Alkaloids. Part VIII. Picraconitine. W. R. Dunstan and E. F. Harrison. (*Proc. Chem. Soc.*, No. 132.) The authors have examined specimens of salts of picraconitine, an amorphous alkaloid obtained by T. B. Groves, in 1874, from the roots of *Aconitum Napellus*, the composition and properties of which were subsequently investigated by C. R. A. Wright (*Year-Book of Pharmacy*, 1877 and

1878). Its composition was then represented by the formula $C_{31}H_{45}NO_{10}$, that of aconitine being $C_{33}H_{43}NO_{12}$. It furnished crystalline salts and an amorphous aurochloride. When heated with alkalies it underwent hydrolysis, yielding equimolecular proportions of benzoic acid and picraconine, a base closely resembling aconine, the similar product from aconitine. Picraconitine was sparingly soluble in water, but readily in ether. Its salts have an intensely bitter taste, whence the names given to the substance, but they do not produce tingling of the tongue and lips, which is so characteristic of aconitine. T. B. Groves had not previously obtained this alkaloid from other collections of the roots of this plant, and neither he nor C. R. A. Wright was able to isolate it subsequently. It has therefore been suggested that it originated from the roots of some other species of aconite, which were mixed in this collection with those of *A. Napellus*. In the course of the present investigation of the alkaloids of *A. Napellus*, no alkaloid having the composition of "picraconitine" has been obtained. Picraconitine, however, in many of its properties resembles the isomeride of aconitine, isaconitine. The fact that this isomeride is difficult to purify, except by adopting special methods, suggested the view that "picraconitine" might be impure isaconitine. An examination of Groves's specimens of "picraconitine nitrate" and "picraconitine muriate" has confirmed this view. The base regenerated from these salts exhibited all the properties of isaconitine, and on converting it into the hydrochloride and purifying this salt, first by crystallization from hot water, and afterwards from a mixture of alcohol and ether, pure isaconitine hydrochloride, melting at 217°, was obtained. In order to complete the proof, the characteristic aurochlorisaconitine, $C_{33}H_{44}(AuCl_2)NO_{12}$, was prepared from the "picraconitine" salts. "Picraconitine" can therefore no longer be retained as the name for an alkaloid derived from *A. Napellus*. The present investigation has shown that this plant contains, besides *aconitine* and the non-toxic *isaconitine*, and *aconine*, a very small quantity of an amorphous alkaloid yielding crystalline salts, which has been named *homoisaconitine*, and generally a considerable quantity of a base which neither crystallizes nor furnishes crystalline salts.

Contributions to the Knowledge of the Aconite Alkaloids. Part IX. The Action of Heat on Aconitine. W. R. Dunstan and F. H. Carr. (*Proc. Chem. Soc.*, No. 132.) The authors find that when aconitine is heated at its melting-point (188-190°) it loses about 10 per cent. of acetic acid, which distils over, leav-

ing a new alkaloid, which they propose to name *pyraconitine*, $C_{33}H_{45}NO_{12} = C_2H_4O_2 + C_{31}H_{41}NO_{10}$.

Pyraconitine is obtained in the form of an amorphous varnish, sparingly soluble in water, but readily in alcohol, chloroform, and ether. It has no effect on polarized light, and is not poisonous in small doses. The alkaloid readily dissolves in acids, forming salt which can be crystallized.

Pyraconitine hydrobromide, $C_{31}H_{41}NO_{10} \cdot HBr$, forms prismatic crystals melting at 280° (corr.). The salt is readily soluble in water and alcohol, but is not dissolved by ether. It is best crystallized from a mixture of alcohol and ether. In aqueous solution it is lævorotatory: $[\alpha]_D = -46{\cdot}47°$.

Pyraconitine hydrochloride, $C_{31}H_{41}NO_{10} \cdot HCl$, crystallizes in rosettes from a mixture of alcohol and ether. It melts at 249°.

Pyraconitine hydriodide, $C_{31}H_{41}NO_{10} \cdot HI$, also crystallizes in rosettes, which become yellow when exposed to air. It melts at 220·5° (corr.).

The solutions of these salts have a bitter taste, but are not toxic, at all events in small doses.

Pyraconitine aurochloride, $C_{31}H_{41}NO_{10} \cdot HAuCl_4$, is thrown down as a pale yellow precipitate when auric chloride is added to a solution of the hydrochloride. No aurochlor-derivative could be obtained.

Pyraconitine and its salts readily undergo hydrolysis when heated with dilute acid or with water in a closed tube. Potash and soda quickly hydrolyse the alkaloid, even in the cold, but ammonia does so only very slowly. The sole products of hydrolysis are *benzoic acid* and an alkaloid which has been named *pyraconine*, $C_{31}H_{41}NO_{10} + H_2O = C_7H_6O_2 + C_{24}H_{37}NO_9$.

Pyraconine is an amorphous base resembling aconine in its properties, but differing from it in several respects. It is soluble in both water and ether. The aqueous solution has a somewhat sweet taste, and is lævorotatory: $[\alpha]_D = -90{\cdot}99°$. It combines with acids to form crystalline salts which are very soluble in water.

Pyraconine hydrochloride, $C_{24}H_{37}NO_9HCl$, crystallizes from water in cubes containing 1 mol. of water. It melts at 159° (corr.), and is soluble both in alcohol and in water. The aqueous solution is lævorotatory: $[\alpha]_D = -102{\cdot}07°$.

Pyraconine aurochloride, $C_{24}H_{37}NO_9 \cdot HAuCl_4$, is a pale yellow, amorphous precipitate.

The salts of aconitine also furnish pyraconitine, losing acetic acid when heated at about 190°. Isaconitine and aconine, however,

do not undergo a similar decomposition. The authors consider it probable that the production of acetic acid from aconitine may serve as the basis of a process for the estimation of this alkaloid.

Contributions to the Knowledge of the Aconite Alkaloids. Part X. Further Observations on the Conversion of Aconitine into Isaconitine. W. R. Dunstan and F. H. Carr. (*Proc. Chem. Soc.*, No. 132.) In a former communication, the authors showed that when certain aconitine salts are heated at 100° in slightly acid solution they are very slowly changed into the salts of isaconitine. They have since found that this conversion may be effected with great rapidity by heating a neutral aqueous solution in a closed tube at 120–130° during from two to three hours, when the aconitine salt disappears, often so completely that the solution produces no tingling sensation on the tongue. The isaconitine is separated from the solution which has been rendered alkaline with ammonia by repeated extraction with ether.

It has also been proved that the production of isaconitine invariably precedes the hydrolysis of aconitine into aconine and benzoic acid, not only when the hydrolysis is effected by acid, as was pointed out in a previous paper, but also, as has now been found, when water alone is used as the hydrolytic agent. In previous experiments, the formation of isaconitine during the hydrolysis of aconitine in presence of alkali could not be proved, owing to the rapidity with which aconine is produced. If, however, a considerable excess of an aqueous solution of soda be added to a solution of an aconitine salt, and the precipitated alkaloid be allowed to stand in contact with the cold alkaline solution until some of the alkaloid is dissolved, extraction with ether separates a notable quantity of isaconitine, as well as the unchanged aconitine. It therefore appears that the non-toxic aconine is really the product of the hydrolysis of the non-toxic isaconitine into which the aconitine first changes.

The observations recorded in the foregoing paper, which prove that aconitine salts as well as the alkaloid lose acetic acid when they are heated, led the authors to look for the production of this acid when solutions of these salts are heated. It has been found that some acetic acid is formed when aconitine salts are heated with water in the manner above described, and also when these salts or the alkaloid are hydrolysed.

The authors are engaged in investigating the origin and amount of the acetic acid produced under various conditions, and also in determining whether pyraconitine is formed in corresponding

quantity or whether aconitine may be an acetyl derivative which loses its acetyl group on hydrolysis. They state that if the latter view should prove correct, the nomenclature and formula of aconitine derivatives will need revision.

Aconitine. M. Freund and P. Beck. (*Ber. der deutsch. chem. Ges.*, xxvii. 433–436, 720–733; also *Journ. Chem. Soc.*, May and June, 1894.)

The results of numerous combustions, as well as other considerations referred to in this paper, lead the authors to adopt the formula $C_{34}H_{47}NO_{11}$ for aconitine, instead of $C_{33}H_{45}NO_{12}$, which has been ascribed to it by Dunstan and his collaborators.

The product obtained by boiling aconitine with water was regarded by Ehrenberg and Purfürst as a mixture of the benzoates of two bases. By repeatedly crystallizing this product the authors of the present paper have obtained a homogeneous compound fusing at 202–203° C., and corresponding to the formula $C_{39}H_{51}NO_{12}$, which they regard as the benzoate of a base $C_{32}H_{45}NO_{10}$, derived from aconitine in accordance with the following equation:—

$$C_{34}H_{47}NO_{11}+H_2O=CH_3\cdot COOH+C_{32}H_{45}NO_{10}.$$

This base is found by them to be identical with Dunstan's "isaconitine," and also identical with Groves and Wright's "picraconitine," which name they propose to retain for this alkaloid.

Concurrently with the above change occurring in the action of boiling water on aconitine, another reaction is found to proceed, in which water is assimilated and benzoic and acetic acid formed, together with a base $C_{25}H_{41}NO_9$. This base is also obtained by boiling picraconitine with alcoholic potash; it has all the properties of aconine.

Aconitine therefore appears to be acetylbenzoylaconine.

Dunstan and Passmore's observation that apoaconine is formed by benzoylating aconine is regarded by the authors as doubtful. Apoaconitine does not appear to exist, and the so-called japaconitine, $C_{66}H_{88}O_{21}N_2$, appears to be also identical with ordinary aconitine. The molecular weight of the latter in benzene solution was found to be 663 (calc. 645). The melting-point of aconitine varies according to the rate at which it is heated. It is usually stated to be 188–189°; but when the temperature is rapidly raised, it is observed to be 197–198°. The α- and β-aurochlorides, the nitrate, and the hydrobromide all give numbers on analysis which agree well with the formula proposed by the authors.

Picraconitine (isaconitine) aurochloride is amorphous, and melts indefinitely at 125–135°. The colourless compound melting at 204°, obtained by Dunstan and Harrison by the gradual evaporation of its alcoholic solution, could not be obtained. The hydriodide forms splendid white crystals which soften at 201–202°, and then melt at 204 205°. The hydriodide of isaconitine melts, according to Dunstan, at 240°. *Picraconitine nitrate* is only slightly soluble in water, and crystallizes from alcohol in coarse prisms, which become yellow at 210°, and decompose at 240 250°.

The second crop of crystals from the liquid obtained by boiling aconitine with water consists of the acetate of picraconitine. The mother-liquor, after the removal of all the picraconitine, yielded, after neutralization and evaporation, a residue of aconine, which was converted into the hydrochloride. This substance agrees in properties with the compound described by Dunstan and Passmore, but appears from a number of analyses to have the formula—

$$C_{25}H_{41}NO_9, HCl,$$

and not $C_{26}H_{41}NO_{11}$, HCl, $2H_2O$, which has been ascribed to it.

Aconine is also formed by the action of boiling alcoholic potash on picraconitine.

When picraconitine is boiled with acetic anhydride, it yields, along with an amorphous substance, an *acetyl-derivative*, $C_{32}H_{44}AcNO_{10}$, which crystallizes from alcohol in prisms melting at 255–256°.

Aconine and picraconitine contain the four methylic groups originally present in the molecule of aconitine.

Aconitine. W. R. Dunstan. (*Ber. der deutsch. chem. Ges.*, xxvii. 664.) Referring to the recent observations of M. Freund and P. Beck (preceding abstract), the author points out that he and his co-workers have already shown (see this vol., pp. 39 and 41) that aconitine, on hydrolysis, yields acetic acid and "isaconitine," and that the latter is identical with Wright's "picraconitine." He claims priority with regard to these observations, and reserves for future discussion the issue raised by Freund and Beck respecting the formula for aconitine. He also alludes to the obvious conclusions that aconitine must be acetylbenzoylaconine, and the so-called "isaconitine" benzoylaconine (and is therefore not isomeric with aconitine), a definite expression of which will be found in the full text of his recent papers published in the journal of the Chemical Society.

The Nature of Aconitine. W. R. Dunstan. (*Pharm. Journ.*, 3rd series, xxiv. 773, 774.) This paper consists of the substance of an interesting lecture given by the author at a meeting of the Pharmaceutical Society, reviewing the work done by him and his friends in connection with this subject during the last twelve months. For particulars, reference should be made to the source given.

Hyoscine and Oscine. O. Hesse. (*Liebig's Annalen*, cclxxvi. 84-86.) The aurochloride obtained from commercial hyoscine hydriodide has the composition $C_{17}H_{21}NO_4HAuCl_4$, and melts at 198°. As thus prepared, it appears to contain a trace of an unknown alkaloid, which does not, however, alter its composition.

With reference to oscine (Ladenburg's pseudotropine), the author states that the formula of benzoyloscine was erroneously given by him in 1892 (*Year-Book of Pharmacy*, 1893, 47) as $C_{15}H_{17}NO_4$, and should be altered to $C_{15}H_{17}NO_3$. The formula given for oscine aurochloride ought to be changed accordingly to $C_{15}H_{17}NO_3, HAuCl_4$. On warming benzoyloscine with hydrochloric acid, it is decomposed into oscine and benzoic acid.

Hyoscine. O. Hesse. (*Liebig's Annalen*, cclxxvii. 304–308.) Compare also *Year-Book of Pharmacy*, 1893, 47 and 48.

Further evidence is supplied by the author in this paper in support of E. Schmidt's assertion that Ladenburg's hyoscine is identical with scopolamine, and is therefore not a new mydriatic base. He also confirms his own statement that the correct formula for this body is $C_{17}H_{21}NO_4$, and that on decomposition at 60-100° C. it yields oscine, $C_8H_{13}NO_2$, which is identical with scopoline.

Alkaloids of Belladonna. O. Hesse. (*Liebig's Annalen*, cclxxvii. 290–300.) Merck has stated that atropamine is identical with Pesci's apoatropine (see *Year-Book of Pharmacy*, 1892, 39). He has subsequently shown that the latter alkaloid, like atropamine, may be converted into belladonnine (see *Year-Book of Pharmacy*, 1893, 48).

Apoatropine could not be prepared by following Pesci's directions, but is obtained without secondary products when a solution of atropine sulphate in nitric acid of sp. gr. 1·381 is kept at the ordinary temperature for 24 hours; or when atropine sulphate or hyoscyamine sulphate is dissolved in concentrated sulphuric acid in the cold, and the solution poured into water; or when the last-named salts are heated at 85° with acetic, benzoic,

or phosphoric anhydride; but not when they are treated under any circumstances with hydrochloric acid. The base is difficult to obtain in a crystalline condition, and the author now confirms Merck's observations that it is identical with atropamine.

Belladonnine is obtained when a solution of atropine or of hyoscyamine in concentrated sulphuric acid is allowed to remain for a short time. The platinochloride melts at 229°, and the aurochloride at 120°. If hyoscyamine is slowly raised to a temperature of 120–130°, it is first converted into atropine, thence into apoatropine, and finally into belladonnine. When apoatropine is treated with alkalies or with hydrochloric acid, it is converted either into belladonnine or decomposition products of the latter, or undergoes more advanced decomposition; the reason, therefore, that both Pesci and Merck obtained tropine from apoatropine was that they subjected the alkaloid to too violent treatment with alkalies, and thus precluded the formation of belladonnine.

When apoatropine is heated in a sealed tube with fuming hydrochloric acid (8 parts) for eight hours at 85–100°, belladonnine and tropine are formed; if, however, the solution is heated for 16 hours at 140°, bellatropine is obtained. The platinochloride, $C_8H_{15}NO_2, H_2PtCl_6$, melts at 212°, and the aurochloride at 163°. The base crystallizes in colourless prisms.

Some New Tropeïnes. A. Petit and M. Polonovsky. (*Journ. de Pharm.* [5], xxviii. 529–531.) In some cases alkyl salts can be substituted with advantage for the corresponding acids in the preparation of tropeïnes by Ladenburg's method. The author describes *benzylotropeïne*, $C_8H_{14}NO \cdot CO \cdot CPh_2OH$, *phenylcarbamotropeïne*, $C_8H_{14}NO \cdot CO \cdot NHPh$, and *succinotropeïne*, and some of their salts. For particulars the original account should be consulted.

Solnine. J. U. Lloyd. (*Amer. Journ. Pharm.*, lxvi. 161, and *Pharm. Journ.*) The author gives this name to an alkaloid isolated by him from the root of *Solanum carolinense*. It forms brilliant white crystals, and is practically insoluble in water and dilute ammonia, but dissolves freely in dilute acids, forming very soluble salts, which have not yet been crystallized. The salts are acrid and bitter, and leave a persistent tingling sensation on the tongue. The alkaloid is also very soluble in cold chloroform and in boiling alcohol, separating from the latter on cooling in large needle-like crystals resembling hydrastine. By evaporation from an ether solution a glassy residue remains. Water precipitates minute

crystals from the alcoholic solution. The author points out that G. A. Krauss proved the presence of an alkaloidal substance in *S. carolinense* in 1890, and shows that it is doubtful if the product obtained by either of them is identical with solanine. A considerable amount of the alkaloid, however, has been forwarded to Professor Trimble for further examination.

Constitution of Morphine. G. N. Vis. (*Journ. prakt. Chem.* [2], xlvii. 584-591; *Journ. Chem. Soc.*, September, 1893.) The author summarizes the known facts with regard to morphine, and the conclusions to be drawn from them, as follows:—

1. The nitrogen atom in morphine has a methyl group attached to it.

2. Morphine is a tertiary base.

3. Morphine yields pyridine in several reactions, and therefore probably contains a pyridine ring.

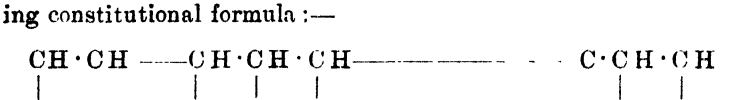
4. Morphine derivatives easily pass into phenanthrene derivatives, indicating either the presence of a phenanthrene nucleus, or an unusual predisposition for the production of one.

5. By suitable oxidation, morphine yields picric acid, and by fusion with caustic alkali, protocatechuic acid; both reactions indicate a benzene ring, and the latter suggests analogy of constitution with that of papaverine, which so readily yields protocatechuic acid.

6. Morphine contains two hydroxyl groups, one of which has phenolic functions, the other alcoholic functions. The third oxygen atom in morphine is indifferent, and apparently of an ethereal nature.

7. The hydroxyl group, which is apparently alcoholic, retains its character in methylmorphimethine, and also, it would seem, in the hydroxyethyldimethylamine.

In accordance with these facts, the author suggests the following constitutional formula:—



Narceïne. M. Freund and G. B. Frankforter. (*Liebig's Annalen*, cclxxvii. 20-58.) The authors' results indicate that the generally accepted formula for narceïne, $C_{23}H_{29}NO_9+2H_2O$ should be altered to $C_{23}H_{27}NO_8+3H_2O$. The hydrated base fuses near 170° C., and parts with two molecules of water at 100° C. When rendered anhydrous at a higher temperature, it fuses at

140–145°, and readily absorbs 1 molecule of water on exposure to air. On oxidation with acid and alkaline permanganate, and likewise with nitric acid, narceïne yields hemipinic acid; but no confirmation has been obtained by the authors of the formation of the narceïnic acid described by Claus and Meixner.

Pseudonarceïne, the alkaloid obtained by Roser on heating narcotine methiodide with alkalies, is regarded by the author as identical with narceïne.

Papaverine Ethobromide. A. Claus. (*Journ. prakt. Chem.* [2], xlvii. 523-531.) The author deals with the crystallography of this compound, and describes two bases obtained from it by the action of alkalies.

Alkaloids of the Papaveraceæ. E. Schmidt, G. Koenig, and W. Tietz. (*Archiv der Pharm.*, ccxxxi. 136–183. From *Journ. Chem. Soc.*) In the introduction to the paper, a list is given of the alkaloids known to occur in plants of this order, and the physiological properties of these alkaloids are described. There follows, then, a detailed account of the

Alkaloids of the root of Sanguinaria canadensis, for the method of separating which reference should be made to the original paper.

Chelerythrine, $C_{19}H_{11}(OMe)_2NO_2$, is the main constituent. It forms small, colourless, rhombohedral crystals of the formula $C_{19}H_{11}(OMe)_2 + EtOH$, often united in crusts, melts at 203°, has a blue fluorescence, and yields yellow salts. The *hydrochloride*, $C_{21}H_{17}NO_4, HCl$ ($+ 5H_2O$ from water, $+4H_2O$ from alcohol), *hydriodide*, and *platinochloride* form yellow needles, the *aurochloride* brown needles.

Sanguinarine, $OMe \cdot C_{19}H_{12}NO_3 + H_2O$, forms bundles of white needles or nodular aggregates, melts at 213°, has a bluish-violet fluorescence, and yields blood-red salts. The *hydrochloride*, $C_{20}H_{15}NO_4, HCl$ (from water, $5H_2O$?; from alcohol, $2H_2O$?), and *nitrate* with $1H_2O$, form red needles, the *platinochloride* a yellow, and the *aurochloride* a reddish-brown, amorphous powder.

γ-Homochelidonine, $C_{19}H_{15}(OMe)_2NO_3$, crystallizes from ethylic acetate ($+\frac{1}{2}CH_3 \cdot COOEt$) in large, colourless plates, melts at 169° when quite dry, when air-dried at 159–160°, and yields colourless salts. The *platinochloride* forms a yellow, the *aurochloride* a yellowish-red powder. The alkaloid is apparently a tertiary base, for it yields a *methiodide*, $C_{21}H_{21}NO_5, MeI$, which, with moist silver oxide, yields a hydroxide, from which a *platinochloride*, $(C_{21}H_{21}NO_5)_2, Me_2PtCl_6$, was obtained as a yellow, amorphous powder.

β-Homochelidonine, $C_{21}H_{21}NO_5$, forms bundles of lustrous needles, melts at 159°, and yields colourless salts.

Sanguinaria-protopine, $C_{20}H_{17}NO_5$, crystallizes in two interconvertible forms—in white, nodular aggregates and colourless, lustrous, monoclinic prisms; it melts at 207°, and forms colourless salts. The *platinochloride*, with $4H_2O$, is yellow, the *aurochloride* a reddish-brown, amorphous powder.

The protopine of the root of Chelidonium majus (*Chelidonium-protopine*) has been again prepared; it melts at 204°, and it and its platinochloride and aurochloride (melting at 198°) seem to be identical with the compounds obtained from *Sanguinaria protopine*.

The chelerythrine of the root of Chelidonium majus has been again prepared, and seems identical with the alkaloid obtained from *Sanguinaria canadensis*. Both these alkaloids melt at 203°, and their aurochlorides, melting at 233°, and platinochlorides are identical.

Quinine, Cinchonine, Cinchonidine, and Conchinine. O. Hesse. (*Liebig's Annalen*, cclxxvi. 88–127.) On heating quinine hydrochloride at 85° with hydrochloric acid of 1·189 sp. gr., the *dihydrochloride*, $C_{20}H_{25}ClN_2O_2, 2HCl$, derived from Comstock and König's hydrochloroquinine, is formed. When this salt is dissolved in concentrated sulphuric acid, a sulphonic acid is produced. A base, giving a soluble crystalline tartrate, is isolated from the mother-liquor obtained in the preparation of the last-mentioned dihydrochloride; it is identical either with the author's isoquinine or with Skraup's pseudoquinine.

The greater part of this paper deals with derivatives of cinchonine, cinchonidine and conchinine, for particulars of which the original should be consulted.

Quinine Alkaloids. E. Grimaux. (*Pharm. Journ.*, from *Comptes Rendus*, cxviii. 1303.) The author states that the physiological and therapeutic action of the series of ethers derived from cupreine increases as they ascend in the series, thus:—

$C_{19}H_{21}N_2O \cdot OH$, Cupreine.
$C_{19}H_{21}N_2O \cdot OCH_3$, Quinine.
$C_{19}H_{21}N_2O \cdot OC_2H_5$, Quinethyline.
$C_{19}H_{21}N_2O \cdot OC_3H_7$, Quinpropyline.

Quinine is slightly more toxic than cupreine, and quinethyline than quinine, while quinpropyline is about four times as toxic as quinine, and may be found of use as an antipyretic in the case of

continuous fever. Study of the therapeutic action of quinethyline shows it to be a much better antiperiodic than quinine.

Preparation of Benzoylcinchonine. E. Léger. (*Journ. de Pharm. et de Chim.*, November, 1893, 405.) The author's method is a modification of Schützenberger's process published in 1858. 50 grams of precipitated and dried cinchonine are heated with 30 grams of benzoyl chloride on a water-bath for an hour; the product of the reaction is treated with water, and subsequently with an excess of ammonia, and agitated with ether. The ethereal solution, after being repeatedly washed with water, is concentrated by distillation, and allowed to stand for twenty-four hours; it is then decanted, evaporated, and the viscous residue dried over sulphuric acid under a bell jar. After complete solidification, it is powdered, re-dissolved in ether, and the filtered ethereal solution concentrated and allowed to crystallize.

Benzoylcinchonine thus obtained is insoluble in water, but soluble in alcohol and ether. It is slightly lævogyre, and its optical activity is still less in acid than in alcoholic solution, and further diminishes with any increase in the proportion of acid. The author's paper also contains a description of a number of salts of this base.

Pseudocinchonine. E. Lippmann and F. Fleissner. (*Monatshefte*, xiv. 371–375.) When cinchonine trihydriodide is heated with a small quantity of water for 5–6 hours at 150–160°, it gradually dissolves, and, on keeping the solution, a yellow, acicular precipitate is slowly deposited, consisting of the hydriodide of pseudocinchonine, a base isomeric with cinchonine.

The base may be isolated by taking advantage of the slight solubility of the normal sulphate. The product of the above action is precipitated with ammonia, and the mixed bases are suspended in water and cautiously neutralized with dilute sulphuric acid. Pseudocinchonine sulphate soon separates, whilst the sulphates of cinchonine and isocinchonine remain in solution. The free base is precipitated by ammonia from the hot aqueous solution.

Pseudocinchonine, $C_{19}H_{22}N_2O$, is a white, flocculent or granular substance melting at 214–216° (cinchonine melts at 250–252°, and isocinchonine at 126–127°). It is soluble in ether, and may be thus readily separated from cinchonine. The *normal sulphate* forms long, slender, asbestos-like needles, and, unlike the corresponding salts of cinchonine and its other isomerides, is anhydrous. The *platinochloride* and *dihydriodide* are described.

Cinchonifine. E. Jungfleisch and E. Léger. (*Comptes Rendus*, cxviii. 536–538; *Journ. Chem. Soc.*, 1894, 351.) Cinchonifine is best obtained by crystallizing from large quantities of strong, boiling alcohol that portion of the cinchonine bases which is insoluble in ether or in dilute alcohol. The cinchonifine separates on cooling, whilst apocinchonine and cinchonibine remain in solution. The purification is accelerated by converting the cinchonifine into basic sulphate, which is crystallized repeatedly from hot water, the free base being subsequently crystallized from boiling alcohol.

Cinchonifine forms small, brilliant, colourless, anhydrous needles, insoluble in water, ether, or dilute alcohol, and very slightly soluble in alcohol or in chloroform, but soluble in a mixture of the two. It melts at 273·6° (corr.) and, when more strongly heated, decomposes and volatilizes. It is dextrogyrate in alcoholic solution; at 17° $[\alpha]_D = + 201{\cdot}4°$ with a solution of 0·75 gram in 100 c.c., but the rotatory power increases with the concentration. A 1 per cent. solution in dilute hydrochloric acid (2 H Cl) gives $[\alpha]_D = + 228{\cdot}9°$, or with 4 H Cl + 226·3°; a 1·5 per cent. solution with 2 H Cl gives $[\alpha]_D = + 225{\cdot}13°$.

Cinchonifine is alkaline to litmus, but not to phenolphthalein; it yields two classes of salts, which, as a rule, are very soluble in water, and crystallize well. A number of these are described in the original paper.

Strychnine Nitrate. E. Guignet. (*Journ. de Pharm.* [5], xxix. 24–26.) This salt, when prepared by dissolving strychnine in dilute nitric acid and evaporating the solution, is always more or less coloured. The author shows that a colourless product can be obtained by suspending the alkaloid in hot water, and carefully adding dilute nitric acid, drop by drop, until the strychnine is almost entirely dissolved. The neutral solution thus obtained is then evaporated to the point of crystallization.

Composition of the Crystals deposited in Liquor Strychninæ Hydrochloratis. W. Duncan. (*Pharm. Journ.*, 3rd series, xxiv. 759.) The author's examination of the crystals formed in acid solutions of strychnine hydrochloride affords evidence that these crystals consist of the neutral and not of an acid salt as has been assumed. Full details of experiments are given.

The Melting-Point of Cocaïne Hydrochloride. O. Hesse. (*Liebig's Annalen*, cclxxvi. 342–344 and cclxxvii. 308, 309.) The author refers to Kinzel's statement that the melting-point of purified cocaïne hydrochloride is 200–202° C., and points out that

though this statement appears to be correct when the melting-point is determined in a sulphuric acid bath and the temperature is raised rapidly, the case is quite different when the heating is conducted slowly and under other conditions. When the salt is heated at 160–161° in a Roth's apparatus, it sinters at the end of 15 minutes, swells up after 25 minutes, and is completely fused in 31 minutes; these changes take place, although more slowly, even at as low a temperature as 152–154°. In a sulphuric acid bath, too, a melting-point much lower than 200° C. may be obtained, if the temperature is raised very slowly and the bulb of the thermometer is not very small; under such conditions it was found not to exceed 186° C.

A Reaction of Cocaïne Salts. M. Lewy. (*Pharm. Zeitung*, 1893, 614.) Solutions of cocaïne salts, when mixed with a solution of borax, form a precipitate which dissolves on the addition of glycerin. On warming this glycerin solution in a test-tube, a turbidity becomes observable near the surface and gradually extends downwards throughout the entire liquid. This turbidity completely disappears again on cooling.

A Reaction of Cocaïne. M. Schaerges. (*Schweiz. Wochenschr. für Pharm.*, xxxi. 341–343.) A small quantity of the alkaloid when dissolved in one drop each of water and sulphuric acid forms a colourless solution which on the addition of 1 drop of potassium chromate produces a precipitate disappearing almost instantly. On warming the mixture, it assumes a green colour and gives off fumes resembling those of benzoic acid.

Eserine. A. Petit and M. Polonovsky. (*Journ. de Pharm.* [5], xxix. 55–59.) Eserine or physostygmine, $C_{15}H_{21}N_3O_2$, the active principle of the Calabar bean, crystallizes from benzene in large, well-defined, flat prisms, and melts at 105–106°, and not at 69° as commonly stated. The sp. rotatory power in chloroform solution is $[\alpha]_D = -82°$, in 98 per cent. alcoholic solution, −89°, and in benzene or toluene solution, −120°. The *benzoate*, which is quite stable, crystallizes in small, hard, white prisms, and melts at 115–116°; the sp. rotatory power in 98 per cent. alcoholic solution is $[\alpha]_D = 98{\cdot}1°$.

A description is also given in this paper of the normal tartrate, acid citrate, methiodide, parahydroxytoluate, and metahydroxytoluate of eserine.

Pseudopelletierine. G. Ciamician and P. Silber. (*Ber. der deutsch. chem. Ges.*, xxvi. 2738–2753.) In a further report on the alkaloids from the rind of pomegranate root, the authors suggest

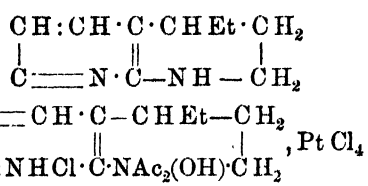
that the name pseudopelletierine should be changed to *granatonine*, as better indicating its character. It seems to be a ketoamine; it does not contain hydroxyl or methoxyl, and is probably a higher homologue of tropine, which it closely resembles. The following products obtained from it are described in the present paper: *granatoline*, $C_9H_{17}NO$; *granatenine*, $C_9H_{15}N$; *granataldehyde*, $C_8H_{12}O$; *granatyl iodide*, $C_9H_{16}NI, HI$; *granatanine*, $C_9H_{17}N$; and *norgranatanine*, $C_8H_{15}N$. For particulars the original paper should be consulted.

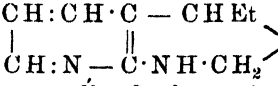
Pseudopelletierine. C. Tanret. (*Bull. de la Soc. Chim.*, 3, xii. No. 10.) The author protests against the substitution of the name *granatonine* for pseudopelletierine, proposed by Ciamician and Silber (see preceding abstract).

Nicotine. F. Blau. (*Ber. der deutsch. chem. Ges.*, xxvi. 1029-1034. From *Journ. Chem. Soc.*) In a further report on this alkaloid, the author points out that on the reduction of nicotine by Liebrecht's method, a mixture of hexahydronicotine and octohydronicotine is obtained; the latter is a di-imide base, and on treating the hydrochloride with nitric acid, it yields *dinitroso-octohydronicotine*, $C_{10}H_{20}N_2(NO)_2$; the corresponding dibenzenesulphonic derivative, $C_{10}H_{20}N_2(SO_2Ph)_2$, is crystalline, and melts at 143·5°; it appears to be identical with the corresponding compound (m. p. 133–134°) stated by Pinner to be derived from hexahydronicotine.

Hexahydronicotine is separated from the octohydrogenated base by fractional precipitation of the platinochlorides, of which the latter is the more soluble, and contains a secondary and a tertiary nitrogen atom; it boils at 214·5 215·5°, crystallizes when anhydrous, and melts at about blood-heat. The *hydrochloride* is hygroscopic; the *platinochloride* melts at 226–228° with decomposition; the *aurochloride* darkens at 175°, and decomposes at 190 191°; the *picrate* is crystalline. The *nitroso-derivative*, $C_{10}H_{19}N_2 \cdot NO$, is soluble, and yields a *platinochloride* which decomposes at 150 152°, and a crystalline *picrate* melting at 140°. In the purification of hexahydronicotine, a base is obtained which has the formula $C_{11}H_{22}N_2$, and boils at 243 245°; its *platinochloride* resembles that of hexahydronicotine in properties and appearance.

Constitution of Nicotine. A. Étard. (*Comptes Rendus*, cxvii. 170–173.) The author suggests the following formulæ for nicotine and its platinochloride:—



Constitution of Nicotine. A. Pinner. (*Ber. der deutsch. chem. Ges.*, xxvi. 2135–2137. From *Journ. Chem. Soc.*) This paper is a reply to Étard, who considers that the production of an acetyl derivative, which forms a platinochloride, proves the presence of an imido group in nicotine, and establishes for it the formula  . Working under similar conditions to Étard, the author prepared, several years ago, a substance which appeared to be an additive compound of 1 mol. nicotine and 1 mol. acetic acid, but its homogeneity was open to doubt, and no conclusions can be drawn from its production. Blau has previously pointed out that if nicotine is represented by Étard's formula, it should yield, on oxidation, hydroxynicotinic acid or amidonicotinic acid, and not nicotinic acid.

Derivatives of Nicotine. A. Étard. (*Comptes Rendus*, cxvii. 278–281. From *Journ. Chem. Soc.*) When dry nicotine is mixed with excess of benzoic chloride, there is no action at the ordinary temperature; but if the mixture is heated intermittently to the boiling-point of the benzoic chloride, there is an abundant evolution of hydrogen chloride, and benzoylnicotine is formed.

Benzoylnicotine is a colourless and somewhat viscous liquid, which has no tendency to crystallize. It has a poisonous odour and a feeble taste, very different from that of nicotine, is insoluble in water, and dissolves only in a considerable excess of dilute hydrochloric acid. It is a feeble, monacid base, and the platinochloride is a pale yellow, crystalline compound, of the composition $(C_{10}H_{13}NBz)_2, H_2PtCl_6$.

It follows that, contrary to the general belief, acid chlorides do act on nicotine, and therefore the latter must contain hydrogen in direct union with nitrogen. This view is confirmed by the fact that, when anhydrous nicotine is heated at 160-170° with dry aldehyde, it yields water and a viscous, insoluble base, with all the characteristics of the bases derived from aldehydes, which were discovered by Gerhardt and are commonly known as Schiff's bases.

The author considers that the cotinine and ticonine described by Pinner cannot contain the group N Me, but must contain secondary nitrogen, whilst the apocotinine and the compound $C_9H_{11}NO_4$, obtained from them respectively by reduction, must be regarded as pyridyl-β-butyric derivatives.

Localization of Nicotine in Tobacco. G. B. De Toni. (*Pharm. Journ.*, 3rd series, xxiv. 623, from *Ricerche istochimiche preliminari sulla pianta del tabacco, Venezia*, 1893.) The author publishes the results of histochemical researches on *Nicotiana Tabacum*, and other species of the genus. He finds the alkaloid, $C_{10}H_{14}N_2$, to be located chiefly in the epidermal tissues. It is absent from the seed and the young plant. In the root of the mature plant it occurs in the cortical tissue, and especially in the layer of cells immediately beneath the epidermis. In the branches, leaf-stalk, lamina of the leaf, peduncle, calyx, and corolla, it is almost entirely confined to the epidermal cells, and occurs especially in those at the base of the hairs. It is found also, in smaller quantities, in the anthers and pistil. The mesophyll and assimilating tissue of the leaf gave uniformly negative results.

Coniine and Nicotine. G. Heut. (*Archiv der Pharm.*, ccxxxi. 376–378.) On shaking aqueous solutions of these alkaloids with chloroform and a minute quantity of phenolphthaleïn, the colour is at once discharged in the case of nicotine, but is left unaltered in the case of coniine. This distinguishing reaction may also be employed quantitatively, by dissolving the mixed bases in a small quantity of water and a little alcohol, then adding to 50 c.c. of this solution 5 drops of chloroform and 1 drop of strong solution of phenolphthaleïn, and titrating with decinormal sulphuric acid, shaking well after each addition, until the colour disappears. The proportion of coniine present having thus been determined, the nicotine is now estimated by adding litmus, and continuing the titration with acid.

Coniine. J. Schorm. (*Chem. Repert.*, xviii. 127. From *Pharm. Journ.*) The author observes that the first distillate in the preparation of coniine effervesces when acidified, and oily drops separate, which soon resinify. By re-distillation without acidifying, the carbonate of the base loses carbonic acid and distils over as hydrate; this can be neutralized with hydrochloric acid, evaporated, heated until free from odour, dissolved in water, decolorized if necessary, and freed from the last traces of impurity by peroxide of hydrogen, which does not attack the coniine salt present. By crystallization large colourless crystals of coniine

hydrochlorate can be obtained; the mother-liquor contains the hydrochlorate of conhydrin and a third base. The latter two can be separated by shaking an alkaline solution with ether, which removes conhydrin, but not the third base. Hydrate of coniine is preferable to coniine as a starting-point for the manufacture of the salts of coniine. Treatment with peroxide of hydrogen is adapted for the purification of nicotine solutions also.

Rotatory Power of Coniine and its Salts. F. Zecchini. (*Gazzetta Chim. Ital.*, xxiii. ii. 601–607; *Journ. Chem. Soc.*, May, 1894.) The author finds the specific rotation of coniine to be $[\alpha]_D = +13{\cdot}51°$ at 23°, a number agreeing closely with those given by former observers. It has a much smaller rotatory power in benzene, alcoholic, or aqueous solutions than when undiluted. The acetate, hydrochloride, and hydrobromide are optically active in alcoholic or benzene solutions, the two latter salts having the same rotatory power in alcohol; $[\alpha]_D = +4{\cdot}42°$. It is, however, very doubtful whether the salts are optically active in aqueous solutions, very small rotations being observed.

A New Reaction of Colchicine. E. Barillot. (*Bull. de la Soc. Chim.* [3], xii., No. 11.) On heating a small quantity of the alkaloid with 0·25 gram of oxalic acid and 1 c.c. of sulphuric acid in a closed tube at 120° C. for an hour, and then allowing to cool, the mixture shows a golden yellow colour, changing to reddish-brown on heating. If the mixture is now dissolved in water, the solution rendered alkaline, and then re-acidified with acetic acid, it yields a yellow colouring matter soluble in chloroform. The yellow residue left after allowing the chloroform to evaporate turns purplish-red on being moistened with strong nitric acid.

Caffearine, a New Alkaloid from Coffee. P. Palladine. (*Apotheker Zeitung*, 1893, 443; *Amer. Journ. Pharm.*, November, 1893.) The new base reported upon by the author is obtained by the following process:—The finely powdered raw coffee is repeatedly boiled with ten times its weight of water, to which a little milk of lime is added; the united decoctions are precipitated with an excess of basic lead acetate, filtered, the excess of lead removed by sulphuric acid, the filtered solution concentrated by evaporation, and the same treatment with basic acetate of lead, etc., repeated as before. The caffeine is now removed by agitating with 12 successive portions of chloroform. The aqueous solution is acidified with sulphuric acid, then freed from acetic acid by repeated evaporation, and subsequently decolorized by animal charcoal. Solution of potassium bismuth iodide is now added in

order to precipitate the caffearine, the precipitate well washed, then suspended in water and decomposed by a current of sulphuretted hydrogen; and after neutralizing the hydriodic acid with lead carbonate, the filtrate is again precipitated with potassium bismuth iodide, and this process repeated until the precipitate is obtained in a distinctly crystalline condition. This is again decomposed with sulphuretted hydrogen, the solution then warmed with silver oxide, afterwards carefully neutralized with hydrochloric acid, and the hydrochlorate of the new base allowed to crystallize. The alkaloid itself, $C_{14}H_{16}N_2O_4$, can be obtained from the hydrochlorate by the use of silver oxide, and is obtainable in crystalline needles which are acted upon by light, and are quite soluble in water and alcohol. The hydrochlorate, $C_{14}H_{16}N_2O_4HCl+H_2O$, forms needles extremely soluble in water, also soluble in dilute alcohol, but insoluble in absolute alcohol. Caffearine is precipitable from its solutions by the usual alkaloid reagents.

Canadine. E. Schmidt. (*Archiv der Pharm.*, ccxxxii. 136.) Pure canadine from the rhizome of *Hydrastis canadensis* proves to be tetrahydroberberine, isomeric with hydroberberine, and yielding berberine on exposing its solution to light and air. It crystallizes in white needles fusing at 132.5° C. A description is given of the process for its preparation and of a number of its salts and derivatives.

Hydrastine. M. Freund and F. Lutze. (*Ber. der deutsch. chem. Ges.*, xxvi. 2488-2490.) Two derivatives of hydrastine are described in this paper, viz., *benzylhydrastine*, $C_{21}H_{20}NO_6 \cdot C_7H_7$, and *benzylhydrasteïne*, $C_{28}H_{29}NO_7$, as well as a number of salts and other compounds of these bodies. For particulars, the original should be consulted.

Gelseminine. L. Spiegel. (*Ber. der deutsch. chem. Ges.*, xxvi. 1054-1060. From *Journ. Chem. Soc.*) Pure gelseminine from *Gelsemium sempervirens*, is amorphous, softens at 105°, and melts at about 120° with partial decomposition; it is precipitated from its salts by ammonia, alkalies and alkali carbonates, and is soluble in excess of these reagents; it is not altered by fusion with potassium hydrate. The *hydrochloride* crystallizes in concentric prisms which darken at 330° without melting; the *hydrobromide* and *hydriodide* are crystalline and unstable; the *sulphate* is amorphous; the *nitrate* is deposited from alcohol in strongly refractive octahedra or tetrahedra, and melts at 188° with decom-

position. The *platinochloride* is yellow and probably amorphous; the *aurochloride* is also amorphous and brown in colour.

Gelseminine does not contain any methoxy-groups, as is shown by its behaviour towards hydriodic acid; with phenylhydrazine, a crystalline compound is formed in small quantity, but has not been investigated.

Gelseminine methiodide crystallizes with $2H_2O$ and melts at 285° with decomposition: it does not react with alkalies, but is decomposed by silver oxide yielding an amorphous substance. On fusion with potash, the methiodide is resolved into two nitrogenous bases, one of which is volatile, has a fishy smell, and yields a crystalline *hydrochloride*.

Gelseminine yields two products on oxidation with potassium permanganate; the one is yellowish brown and amorphous, the other is a colourless acid; both are being further investigated. With dilute nitric acid, the base yields a number of brown indefinite products, together with an acid, $C_{17}H_{20}N_3O_8$, which is deposited from alcohol in pale yellow crystals; it darkens at 350° without melting, and is not acted on by concentrated nitric acid. The brown compounds, on treatment with concentrated nitric acid, yield a colourless, crystalline substance.

Gelseminine combines with one equivalent of acids; the author has made numerous analyses of the base, the hydrochloride, and the nitrate; his results show that Sonnenschein's formula, $C_{22}H_{38}N_2O_4$, is incorrect, but they are inadequate to distinguish between the formulæ $C_{24}H_{28}N_2O_4$ and $C_{22}H_{26}N_2O_3$. The identity or otherwise of gelseminine and gelsemine is also undetermined.

Sparteïne. F. B. Ahrens. (*Ber. der deutsch. chem. Ges.*, xxvi. 3035-3042.) In this paper a number of bases are described obtained from sparteïne by the action of hydrogen peroxide, silver or mercuric oxide, lead peroxide, and bleaching powder respectively. For particulars respecting these bases and their salts, reference should be made to the original.

Corydaline. J. J. Dobbie and A. Lauder. (From a paper read before the Chemical Society, December 21st, 1893.) Corydaline is very stable towards potassium hydrate, only a small portion of the alkaloid undergoing alteration, even when heated at 180° during many hours with a large excess of this agent.

By oxidation with potassium permanganate an acid is obtained which contains three atoms of carbon less than the alkaloid. This substance, which the authors have named *corydalinic acid*, has the

formula $C_{19}H_{21}NO_{12}$. It is easily soluble in hot water, from which it separates, on cooling, in long, flat, prismatic crystals, containing 3 mols. of water of crystallization. Corydalinic acid is also soluble in methyl and ethyl alcohol, but is insoluble in ether, chloroform, and benzene. When heated it sublimes without changing, and then condenses in the form of beautiful, silky needles. It melts without decomposing between 175° and 180°. It is tetrabasic, and forms salts, several of which, as well as some decomposition products of the acid, will be found described in the original account.

Paracotoïn. G. Ciamician and P. Silber. (*Ber. der deutsch. chem. Ges.*, xxvi. 2340–2348.) The authors have found by analyses that the formula of this constituent of paracoto bark is not $C_{19}H_{12}O_6$, as stated by Jobst and Hesse, but $C_{12}H_8O_4$. It crystallizes in yellow plates fusing at 151–152° C. A number of derivatives and additive compounds are described.

Constitution of Cotoïn. G. Ciamician and P. Silber. (*Ber. der deutsch. chem. Ges.*, xxvii. 409–426.) The authors find that the correct formula for cotoïn is $C_{14}H_{12}O_4$, and not $C_{22}H_{18}O_6$, as stated by Jobst and Hesse. When the alkaloid is warmed with strong sulphuric acid, decomposition occurs, and a small amount of phloroglucinol is formed. This fact, and the general resemblance of cotoïn to hydrocotoïn, renders it probable that cotoïn is the monomethyl ether of benzoylphloroglucinol, $OMe \cdot C_6H_2(OH)_2 \cdot CO Ph$.

A New Isomer of Santonin. A. Andreocci. (*Ber. der deutsch. chem. Ges.*, xxvi. 1373–1376.) If a solution of santonin in fuming hydrochloric acid is kept for several days in a stoppered vessel at the ordinary temperature, a crystalline isomeride, *desmotroposantonin*, is formed, which has the following constitution:—

$$\begin{array}{l} HC:C\,Me\cdot C\cdot CH_2\cdot CH\text{——}O \\ \quad\;|\qquad\;\|\qquad\;|\qquad\quad >CO. \\ OH\cdot C:C\,Me\cdot C\cdot CH_2\cdot CH\cdot CH\,Me \end{array}$$

It crystallizes in white needles fusing at 260° C., soluble in alcohol and acetic acid, slightly soluble in ether and benzene, and insoluble in water, solutions of sodium carbonate, and in hydrochloric acid. From its solution in caustic alkalies it is reprecipitated by mineral acids.

The Constitution of Santonin. J. Klein. (*Archiv der Pharm.*, ccxxxi. 213–234.) In the author's opinion the properties and reactions of santonin can only be satisfactorily explained on the

assumption that it is the α-lactone of a hydroxy-α-ketonic acid of the formula—

$$\begin{matrix} CH_2 \cdot CO \\ | \qquad\quad > CO. \\ C_{12}H_{16} \cdot O \end{matrix}$$

The main portion of this paper deals with the results of a further study of santonin derivatives, for particulars of which reference should be made to the source above mentioned.

Santonin. J. Klein. (*Ber. der deutsch. chem. Ges.*, xxvi. 2506–2508.) In a further report on this subject, the author describes various decomposition products resulting from the distillation of santonin, oxysantogenenic acid, and α-santogendilactone. He arrives at the conclusion that the ketonic group in santonin must be in the side chain; the hydroxyl of the two naphthols does not correspond with that of santoninic acid or santonous acid, but is linked to that carbon atom to which, in the original substance, the side chain is attached.

Euparin. C. C. Manger. (*Amer. Journ. Pharm.*, 1894, 120–124.) This constituent of *Eupatorium purpureum* was described by Trimble in the *American Journal of Pharmacy*, 1890, 73 (see *Year-Book of Pharmacy*, 1890, 153). It has now been further investigated by the author, who arrives at the following conclusions:—

Euparin appears to form no sulphur compound with concentrated sulphuric acid. With chlorine it forms a definite but quite unstable substitution product. With acetic anhydride a very unstable liquid compound is formed.

Concentrated nitric acid converts euparin into picric acid. On fusion with potassium hydrate, euparin is converted chiefly into phloroglucol.

Anemonin. W. K. J. Schoor. (*Chem. Centr.*, 1893, ii. 60.) Anemonin is a poisonous substance producing paralysis of the central nervous system. It is contained in many plants of the order *Ranunculaceæ*, and forms rhombic crystals fusing at 152° C. and having a composition corresponding to the formula $C_{15}H_{12}O_6$. Under the influence of oxidizing agents it is converted into anemonic acid, and the same change takes place, though more slowly, on prolonged exposure of anemonin to air.

Scoparin. G. Goldschmiedt and F. v. Hemmelmayr. (*Monatshefte*, xiv. 202–222.) This substance, together with sparteïn was discovered by Stenhouse in the aqueous extract of

Spartium scoparium. It may be purified by repeatedly dissolving it in boiling water, from which it separates, on cooling, as a gelatinous mass, and crystallizing from 70 per cent. alcohol. It forms nodular aggregates of small, yellow needles, melts at from 202-219°, accordingly as it is heated slowly or quickly, and seems to have the composition $OH \cdot C_{19}H_{16}O_8 \cdot OMe + 5H_2O$ (Stenhouse, $C_{21}H_{22}O_{11}$). It reduces Fehling's solution, and gives, with ferric chloride, a violet-blue coloration which quickly becomes dark-brown, or is changed to yellowish-brown by sodium carbonate. A *barium* derivative, $(C_{20}H_{19}O_{10})_2Ba + 2H_2O$, was obtained by boiling an aqueous solution of scoparin with barium carbonate. When heated with hydriodic acid, scoparin yields 1 mol. of methylic iodide, and at the same time loses 1 mol. of water, giving a substance, $C_{19}H_{14}O_8$, which forms a bright yellow, amorphous powder, becomes dark at 175°, and melts with decomposition above 200°. It yields a *monacetyl derivative* forming nearly white crystals, melting at 230–236° when still impure, and a *monethyl derivative* crystallizing in tiny, bright yellow needles, melting with decomposition at 272°. It does not seem to be a glucoside, for when boiled with dilute sulphuric acid no sugar could be detected in the solution; an insoluble, brownish-yellow substance, $C_{20}H_{16}O_8 + 2\frac{1}{2}H_2O$, was, however, formed. When scoparin is boiled with absolute alcohol, it is converted into Stenhouse's "apparently allotropic" modification; this forms a yellow, crystalline powder, melts at 235°, and seems to have the same percentage composition as scoparin itself.

Convolvulin. W. Kromer. (*Pharm. Zeitschr. für Russland*, xxxiii. 1. From *Pharm. Journ.*) Continuing his researches on the convolvulaceous resins, the author has investigated convolvulin obtained from jalap. He finds that this body splits up on treatment with baryta, even without heat, into convolvulinic and methyl-ethyl-acetic acids; the latter, being volatile, appears to have been overlooked by former investigators. Convolvulinic acid is monobasic, and its solution possesses the property of dissolving convolvulin; by hydrolysis it yields convolvulinolic acid and a glucose, the nature of which could not be satisfactorily determined. Convolvulinolic acid is also monobasic and isomeric, but not identical with jalapinolic and scammonolic acids. Mayer's convolvulinol the author considers to be impure convolvulinolic acid.

Synthesis of Gentisin. S. v. Kostanecki and J. Tambor. (*Monatshefte*, xv. 1-8.) On mixing molecular proportions of genti-

sinic acid (hydroquinonecarboxylic acid, $C_6H_3(OH)_2 \cdot COOH$) and phloroglucinol, then adding acetic anhydride and distilling the mixture in a small retort, a sublimate consisting of *gentisein*, $C_{13}H_8O_5$, collects in the neck of the retort, and can be obtained in the form of yellow needles. On treating this substance with methyl iodide and potassium hydrate, the methyl ether of gentisein is produced, which is found to be identical with natural gentisin.

Several benzoyl-derivatives of gentisin are also described in this paper.

Derivatives of Cantharidin. F. Anderlini. (*Gazz. Chim. Ital.*, xxiii. 121–139.) In the first part of this paper the author describes cantharidin hydrazone and its dinitro-derivative, while in the second he deals with a number of derivatives resulting from the action of diamines on cantharidin. For particulars the original should be consulted.

Derivatives of Digitogenin. H. Kiliani. (*Archiv der Pharm.*, ccxxxi. 448–460.) When digitonin is decomposed by dilute hydrochloric acid, digitogenin, $C_{15}H_{24}O$, which is insoluble in water, is formed, together with dextrose and galactose. By the action of chromic acid upon a solution of digitogenin in glacial acetic acid, monobasic digitogenic acid, $C_{14}H_{22}O_4$, is produced, the further oxidation of which with permanganate yields digitic acid, $C_{10}H_{16}O_4$, which is likewise monobasic. The author finds that the assumed existence of the radical $C_9H_{15}O_2$ in digitogenin, digitogenic acid, and digitic acid cannot be maintained. The mother-liquors from digitic acid, when oxidized with permanganate on the water-bath, yield a bibasic acid forming hard granules or minute needles which soften at 170° C. It forms a potassium salt, $C_9H_{13}O_4K + C_9H_{14}O_4 + 7H_2O$, crystallizing in minute needles, and corresponds closely to the isopyrocamphenic acid obtained by Marsh, Balliol, and Gardner from the distillation products of tribasic camphenic acid, $C_{10}H_{14}O_6$. When digitogenic acid is boiled with potash and dilute alcohol, two crystallizable monobasic acids, named by the author *digitoic acid* and *hydrodigitoic acid*, and answering respectively to the formulæ $C_{13}H_{20}O_3$ and $C_{13}H_{22}O_3$, are formed. Digitoic acid is converted by further oxidation into digitic acid.

Note on the Preparation of Pure Digitonin. H. Kiliani. (*Archiv der Pharm.*, ccxxxi. 460, 461.) The strong solution in hot 85 per cent. alcohol of the mixture of glucosides known in commerce as pure digitalin, should be heated on a water-bath at 45° C. for six hours, and then allowed to cool slowly. In this

manner the digitonin is obtained in a form in which it is much more easily separable from the mother-liquor.

Iridin. (*Apotheker Zeitung*, 1893, 523.) Iridin, a glucoside existing in the rhizome of orris (*Iris Florentina*), may be prepared by mixing the alcoholic extract with warm water, shaking with a mixture of acetone and chloroform, and allowing to stand. After separation, the glucoside is found in the heavier stratum of the mixture in the form of white flakes, which, after crystallization from boiling dilute alcohol, yield white, needle-shaped crystals fusing at 208° C., and changing to yellow on exposure to moist air. It is soluble in water, alcohol, and acetone, but insoluble in chloroform; hence it is precipitated from its acetone solution by the latter. It is not decomposed by cold dilute acids, and when treated with alkalies it produces yellow solutions containing products of change. When treated with hot dilute acids in the presence of alcohol, it splits up in accordance with the following equation:—

$$\underset{\text{Iridin}}{C_{24}H_{26}O_{13}} + H_2O = \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Irigenin.}}{C_{18}H_{16}O_8}$$

Irigenin, the product of this reaction, is crystallizable, fuses at 186° C., and produces a deep violet coloration with ferric chloride. When treated with strong alkalies, it yields formic acid, *iridic acid*, $C_{10}H_{12}O_5$, and a phenol of the formula $C_7H_8O_1$, for which the name *irctol* is proposed. Iridic acid fuses at 180° C.; above this temperature it is decomposed into carbonic anhydride and a phenol of the formula $C_7H_5(OCH_3)_2OH$, which fuses at 57° C. and is described under the name *iridol*.

Preparation of Oak Bark Tannin. H. Trimble and J. C. Peacock. From a paper read before the American Pharmaceutical Association. (*Pharm. Journ.*, 3rd series, xxiv. 307, 308.) The authors effect the extraction of this and other tannins by means of acetone, which proves to be a better solvent than either ether or alcohol, and extracts the tannin with less admixture of sugar and other carbohydrates. Its low boiling-point, also, renders its recovery easy and rapid, without risk of decomposing the tannin. Powdered nutgalls which yielded to ether 59·77 per cent., gave up to this solvent 62·24 per cent. The process recommended for the extraction of oak tannin is as follows:—The powdered oak bark is moistened with acetone, packed in a closed percolator, allowed to macerate with acetone for forty-eight hours, and then percolated until exhausted. A dark red or brown semi-solid ex-

tract is left on distilling off the solvent. On treatment of this with water and filtering, diluting the filtrate with more water, and repeatedly agitating the filtrate with successive portions of acetic ether, the tannin thus separated is further treated with ethylic ether, and finally obtained in a nearly pure form in which it is readily and completely soluble in water.

The Tannin of Punica Granatum. J. Culley. (*Amer. Journ. Pharm.*, 1894, 280–282.) The author describes the characters and reactions of the tannin isolated from the root-bark of the pomegranate, and gives the results of three combustions of this substance. He finds that there is sufficient agreement in the properties and composition of this body with those of gallotannic acid from galls as to justify the conclusion that these two tannins are identical.

The Tannin of Tea. A. Hilger and F. Tretzel. (*Forsch. Ber. u. Lebensmittel*, 1893; *Pharm. Journ.*, 3rd series, xxiv. 798.) From the results of combustions and the behaviour of the acetyl compound the authors conclude that this tannin has the composition and general properties of an anhydride of digallic acid, and not those of a glucoside. By long-continued action of dilute sulphuric acid, the tannin of tea is converted into gallic acid and a phlobaphen.

Bromogallic Acid. A. Biétrix. (*Bull. de la Soc. Chim.* [3], ix. 241–243.) The ordinary process of preparing this acid is open to the objection that there is a simultaneous formation of dibromogallic acid, the removal of which presents difficulties. By adding to gallic acid less than the theoretical quantity of bromine dissolved in 3–4 parts of chloroform, bromogallic acid is obtained together with unaltered gallic acid, from which it may be readily separated by crystallization. The pure acid, $C_6HBr(OH)_3 \cdot COOH + 3H_2O$, crystallizes in small, hexagonal plates. A description of some of its salts and derivatives will be found in the original paper.

Glucosides of Alcohols. E. Fischer. (*Ber. der deutsch. chem Ges.*, xxvi. 2400.) Solutions of grape-sugar in methylic and other alcohols, when saturated with hydrochloric acid gas, lose the power of reducing Fehling's solution, and yield a crystalline product having (in the case of methylalcohol) the composition $C_6H_{11}O_6 \cdot CH_3$. These products do not react with Fehling's solution, phenylhydrazine, or boiling solutions of alkalies, but they are converted into sugar and alcohol by the assimilation of the elements of water on boiling with dilute acids. Some of these artificial glucosides have

a sweet and others a bitter taste, and it is conjectured that some of the natural glucosides may be analogous compounds.

Ruberythric Acid. E. Schunck and L. Marchlewski. (*Proc. Chem. Soc.*, No. 132.) This glucoside, like all glucosides hitherto known, is not acted on by phenylhydrazine, and does not contain an aldehyde group. Its constitution must, therefore, be represented in accordance with the formula of Tollens for glucose. When subjected to the action of benzoyl chloride in presence of sodium hydrate, ruberythric acid yields, according to the concentration of the soda solution, either a hepta- or a hexa-benzoyl derivative.

Parasorbic Acid. O. Doebner. (*Ber. der deutsch. chem. Ges.*, xxvii. 344–351; *Journ. Chem. Soc.*, May, 1894.) Parasorbic acid, $C_6H_8O_2$, was prepared by the author from the residue left after the extraction of malic acid from the juice of mountain ash berries. On distillation with steam and subsequent purification, it boiled at 221° under atmospheric pressure, and at 136° under 30 mm., a small quantity of resinous matter being always left behind. It did not solidify in a freezing mixture, and at 21° had the sp. gr. 1·0628. When pure it had no acid reaction, but became acid on standing. It is dextrorotatory, having the specific rotation $[\alpha]_j = +40{\cdot}8°$.

Parasorbic acid passes into the isomeric sorbic acid when heated for a short time with solid potash and a few drops of water, the yield being 70 per cent. Sorbic acid, on the other hand, cannot be transformed into parasorbic acid.

Cathartic Acid. A. Gensz. (*Nouv. Rem.*, ix. 368; *Pharm. Zeitschr. für Russland*, xxxii. 744; *Pharm. Journ.*, 3rd series, xxiv. 183.) The preparation described by the author is stated to differ materially from principles of variable composition previously known by the same name. It is a yellowish-brown powder, slightly soluble in cold water, and readily so in warm water, and in 30 per cent. alcohol; it has a distinct acid reaction, and partakes of the nature of a glucoside. Its composition is represented by the formula $C_{30}H_{36}NO_{15}$. It is prepared by evaporating an infusion of senna in vacuo, mixing the residual extract with an equal volume of alcohol, shaking well, and leaving the mixture to settle for twelve hours. After decanting off the liquid, the deposit is again shaken with alcohol, and finally pressed. The filtered liquids are then precipitated with lead acetate, the precipitate separated and well washed by kneading with water until the washings pass away clear. The partially dried precipitate is

mixed with alcohol and decomposed with sulphuretted hydrogen, excess of the gas driven off by passing a stream of carbonic acid or air through the liquid, then heating the whole in a vessel fitted with a reflux condenser, filtering to separate lead sulphide, and washing with alcohol. The clear liquid is then mixed with ether as long as a pale yellow deposit is produced, which is allowed to settle. After pouring off the ethereal liquid, the brown deposit on the sides of the vessel is washed with ether or strong alcohol, dissolved in a very small quantity of 30 per cent. alcohol, and evaporated at a temperature not exceeding 50° C. The yield amounts to 0·6 to 0·75 per cent. of the senna employed. The product is given in doses of 0·10 to 0·15 gram, and the purgative effect is produced in from five to seven hours.

Abietic Acid. H. Mach. (*Monatshefte*, xiv. 186–201.) Compare also *Year-Book of Pharmacy*, 1893, 61. Abietic acid, $C_{19}H_{28}O_2$, forms white crystals which, when slowly heated, begin to soften at 148°, and fuse at 153–154°.

The various substances hitherto obtained from the resin of pine trees, and named respectively abietic, sylvic, and pimaric acids, are shown to be identical. The name *abietic acid* is retained.

Angelic and Tiglic Acids. J. Wislicenus. (*Liebig's Annalen*, ccIxxiv. 99-119.) This paper deals with a number of bromo-derivatives of these acids. For particulars, reference should be made to the original.

Chrysarobin and Chrysophanic Acid. G. B. Schmidt. (*Pharm. Zeitung*, xxxix. 345.) The author considers A. Andouard's description of the distinctive characters of these two bodies as much more satisfactory than those met with in several of the Pharmacopœias. The characters and tests given by the latter are as follows:—Chrysophanic acid, $C_{15}H_{10}O_4$, forms golden yellow rhombic prisms, which fuse at 162° C., are nearly tasteless, insoluble in water, and soluble in 224 parts of boiling alcohol of 81 per cent., or in 1,125 parts of 30 per cent. alcohol. Acetic acid, chloroform, and benzene likewise dissolve the acid. It is also readily soluble in alkaline solutions, to which it gives a dark red colour. With sulphuric acid it gives a red colour, and with melted caustic potash a blue colour. These reactions distinguish chrysophanic acid from chrysarobin, which gives a yellow colour with sulphuric acid, and a brown colour with caustic potash.

Brazilin. C. Schall. (*Ber. der deutsch. chem. Ges.*, xxvii. 524–530.) The author has already shown that brazilin contains four hydroxyl groups. He has now obtained the tetramethoxy-

compound, and finds it has the same melting-point as the trimethoxy-compound.

A description is also given in this paper of a number of other methyl-, ethyl-, and bromo- derivatives of brazilin.

The Colouring Principles of Rubia Sikkimensis. A. G. Perkin and J. J. Hummel. (*Proc. Chem. Soc.*, No. 128.) The authors have separated both purpurin and munjistin or purpuroxanthincarboxylic acid from this root; they point out that the results show that it is nearly identical, as regards colouring principles, with the closely allied *Rubia munjistin*.

The Colouring Matter of the Indian Dye-Stuff "Tesu." J. J. Hummel and W. Cavallo. (*Proc. Chem. Soc.*, No. 132.) This yellow dye-stuff consists of the dried flowers of *Butea frondosa*. The dyeing power of the flowers as sold is comparatively slight, but is increased by boiling with diluted acid, the glucoside of the dye-stuff becoming hydrolysed.

By boiling the aqueous extract with sulphuric acid, then extracting with ether, and purifying the product by crystallizing it from alcohol and water, the authors have obtained about 1 per cent. of a substance crystallizing in almost colourless needles, melting, when rapidly heated, at 217°. On analysing this, numbers were obtained (C = 65·5 and 65·65; H = 4·93 and 4·67) corresponding with the formula $C_{15}H_{14}O_5$. A large quantity of material is now being operated on.

Instability of Colouring Matters containing Carotene. F. C. Gerlach. (*Journ. Chem. Soc.*, from *Bied. Centr.*, xxii. 786.) The fading of dyes containing carotene is not due to light, but to the oxygen of the air, as the change takes place in darkness as well as in light, but the colour is permanent in light when oxygen is excluded; at the same time the change is assisted by light.

Picramnin. B. Grützner. (*Chem. Zeitung*, 1893, 879.) The author has further examined the crystalline principle isolated by Peckolt from the fruit of *Picramnia camboita*, and described by him under the name picramnin, and arrives at the conclusion that it is the glyceride of an unsaturated fatty acid. Its composition is represented by the formula $C_3H_5(C_{18}H_{31}O_2)_3$. It is obtained from the fruit by extraction with petroleum ether and repeated crystallization from alcohol.

Preparation of Gynocardic Acid. A. Petit. (*Chemist and Druggist*, July 29th, 1893, from *Journ. de Pharm. et de Chim.*) The following is stated to be a convenient process for the preparation of this acid:—Chaulmoogra oil is saponified with solution of

caustic soda of 36° B, and the mixture then boiled with twice its weight of water whilst stirring constantly. When the saponification is complete, common salt is added in sufficient quantity to throw out the soap, which, after cooling, is collected and rapidly washed with a little water. The soap is now decomposed by mixing and warming with dilute sulphuric or hydrochloric acid, the liberated acid washed with warm water, then dissolved in warm alcohol of 60 per cent. strength in the proportion of 100 grams of acid to a litre of the alcohol, and the solution allowed to crystallize. The final product is freed from alcohol by warming on a water-bath.

The Fatty Acids of Rape Oil. G. Ponzio. (*Journ. prakt. Chem.* [2], xlviii. 487, 488.) In addition to the glycerides of erucic and rapic acids, Reimer and Will have obtained from this oil a small proportion of behenic acid. The latter is shown by the author to be identical with arachidic acid, which occurs in the oil to the extent of about 4 per cent.

Solubility of Lead Salts of Stearic and Palmitic Acids in Ether. A. Lidoff. (*Journ. Russ. Chem. Soc.*, xxiv. 524–526.) The author finds that lead stearate and lead palmitate are soluble to the extent of 0·0148 gram of the former and 0·0184 of the latter in 100 c.c. of anhydrous ether at the ordinary temperature.

Characters of the Tars of Birch and Fir. E. Hirschsohn. (*Pharm. Zeitschr. für Russland*, 1893, No. 42; *Amer. Journ. Pharm.*, January, 1894.) *Birch tar* at 20° C. has a specific gravity of 0·926–0·945 for the better grades and 0·953–0·987 for inferior grades. The aqueous solution, obtained by agitating one part of tar with ten parts of water, is almost colourless, has an acid reaction, and is coloured green with ferric chloride (1 : 1000). 5 c.c. of the aqueous solution with 2–3 drops of aniline and 4–6 drops of hydrochloric acid give a yellow mixture; if the birch tar be adulterated with fir tar or other kinds of tar, a red mixture results. Birch tar, when shaken with twenty volumes of benzol, imparts to the latter only a pale-yellow colour; the benzol solution agitated with an aqueous solution of copper acetate (1 : 1000) should not assume a greenish colour. *Fir tar* has a specific gravity at 20° C. of 1·02–1·15; the aqueous solution (1 : 10) has a yellowish colour, an acid reaction, and produces a red coloration with ferric chloride. 5 c.c. of the aqueous solution, when mixed with aniline and hydrochloric acid, give a red mixture which upon agitation with chloroform imparts to the latter an intense red colour. The benzol solution agitated with aqueous copper acetate causes a green

coloration. Fir tar is perfectly soluble in nine volumes of 90 per cent. alcohol; a turbid mixture indicates the presence of birch tar.

Creosotes from Beech and Oak Wood. A. Béhal and E. Choay. (*Comptes Rendus*, cxviii. 1339.) The creosotes from these two sources are found to be identical in composition. Both contain phenol; ortho-, meta-, and para-cresol: ortho-ethyl-phenol; two meta-xylenols; guaiacol; creosol; ethyl-guaiacol; and small quantities of sulphur derivatives, and of a body which, when acted upon by ammonia and air, yields a substance forming deep blue solutions with alkalies, changing to red with acids.

Melissic Alcohol. A. Gascard. (*Journ. de Pharm.* [5], xxviii. 49. From *Pharm. Journ.*) The author has definitely established the identity of the alcohols yielded by beeswax, carnauba wax, and gum lac, by repeatedly purifying them until products of identical melting-point were obtained. In the cases of gum lac and carnauba wax he found the melting-point of the alcohols to be 88°, but that from beeswax melted at 85°, that number according with the one previously published by Brodie. After repeated crystallizations, however, this was gradually raised to 87°. Etherification of the alcohol was next effected, the ether purified and then saponified. The resulting alcohol, after being twice recrystallized from benzene, was found to have a melting-point of 88°, thus according with the figure obtained in the other cases.

The Odorous Constituent of Orris. F. Tiemann and P. Krüger. (*Pharm. Journ.*, from *Comptes Rendus*, cxvii. 548.) The authors state that the odorous principle of orris rhizome is a ketone, $C_{13}H_{20}O$, which they name *irone*. It is an oil, freely soluble in alcohol, ether, chloroform, etc., and boils at 144°, under a pressure of 16 mm. Its specific weight is 0·939, and index of refraction $n_D = 1·50113$. It is dextro-rotatory, forms a crystalline oxime melting at 121·5°, and is transformed into a hydrocarbon, *irene*, $C_{13}H_{18}$, when acted upon by hydriodic acid. An isomeric ketone, *ionone*, $C_{13}H_{20}O$, having also a violet odour, can be obtained from citral. This body distils at 126 128°, has a specific weight of 0·9351, index of refraction $n_D = 1·507$, and may be transformed into the hydrocarbon *ionene*, $C_{13}H_{18}$. The isomeric hydrocarbons, irene and ionene, yield on oxidation an identical product, ioniregene-tricarboxylic acid, $C_{13}H_{12}O_7$.

Vanillin from Cloves. A. Jorissen and E. Hairs. (*Bull. de Pharm. de Bruxelles*, xxxvii. 231.) The authors noting the simi-

larity in composition between vanillin and eugenol, have examined cloves and the essential oil obtained from them to ascertain whether vanillin was one of their constituents. An ethereal tincture of cloves was prepared and treated with solution of sodium bisulphite. This solution, being separated, was then treated with a mineral acid, and the sulphurous acid thus liberated removed, after which the mixture was agitated with ether. This, on being separated and evaporated, left a residue which gave off a strong odour of vanilla. A similar crystalline residue was obtained on subjecting oil of cloves to the same treatment. The crystals were soluble in water, especially when warm, also in alcohol and ether. They were coloured by ferric chloride, began to melt at 79°, and sublimed readily. The yield was very small, so that an extended examination was not possible; but the investigators consider that the physical and chemical characters of the product, so far as they have been ascertained, indicate its identity with vanillin.

Identical Reactions of the Oils of Pimento and Cloves. J. Stern. (*Zeitschr. für angew. Chem.*, 1893, 136 138.) The author finds that these two oils give identical reactions with ether solution of bromine, alcoholic hydrochloric acid, sulphuric acid, Fröhde's reagent, ferric chloride mixed with sulphuric acid, nitric acid, picric acid, lime water, and alcoholic solution of ferric chloride. The pure oils may of course be readily distinguished by their odour.

Characteristics of Crystallized Terpineol. O. Wallach. (*Liebig's Annalen*, cclxxv. 103. From *Pharm. Journ.*) The author has previously shown that terpin, $C_{10}H_{20}O_2$, is to be regarded as a glycol—a saturated dihydric alcohol, $C_{10}H_{14}(OH)_2$—that is readily convertible by elimination of water into the unsaturated monohydric alcohol terpineol, $C_{10}H_{17}\cdot OH$. By further elimination of water the hydrocarbon produced is either terpinene, terpinolene, or dipentene, according to the condition under which the change takes place. The "terpinol" obtained by Wiggers and List by the action of acids upon terpin hydrate has been found to consist of a varying mixture of terpineol with the several hydrocarbons above mentioned. In view of the possibility that in the dehydration of terpin isomeric terpineols may be formed, it seemed probable that the liquid terpineol first obtained was a mixture of such isomers, and in that case the formation of isomeric hydrocarbons from terpineol would be intelligible. Terpineol, however, has since been obtained by Bouchardat and Voiry in a crystalline state, and undoubtedly as an individual substance. The author has, therefore, experimented upon material of this kind obtained from

Messrs. Schimmel. The melting-point was 30–31°, and after purification 35°. It united with carbanil, forming crystalline terpenyl-phenyl-urethane, the melting-point and other characters corresponding with those previously described by the author. The crystalline terpineol, when heated for an hour with perfectly dry potassium bisulphide, distilled and dried with caustic potash, gave a product boiling principally at 178–180°, consisting of a hydrocarbon, $C_{10}H_{16}$, which gave dipentene tetrabromide melting at 125°. By treatment with dilute sulphuric acid the terpineol was converted into a mixture of cineol, dipentene, and terpinolene. With stronger acid the terpineol was partly oxidized. Phosphoric acid had a similar effect. Treatment with oxalic acid gave rise to the formation of some terpinene and cineol, but the chief product was terpinolene. Crystalline terpineol is the best material from which to obtain dipentene or terpinolene. To prepare the former, potassium bisulphate is to be used for eliminating water, and oxalic acid for preparing the latter. The possibility of conveniently preparing tetrabromides of these two hydrocarbons led to the following experiments. It has been shown that limonene tetrabromide treated with alcoholic potash yields a monobromide, $C_{10}H_{15}Br$, and it was probable that dipentene tetrabromide would behave in a similar manner, but it was found to yield only a small quantity of a hydrocarbon and a larger proportion of a heavy bromide, volatilizable with difficulty by steam. Terpinolene tetrabromide behaves quite differently, and the principal product is a hydrocarbon apparently containing cymene.

Constitution of Camphor. G. Gillet. (*Apoth. Zeitung*, ix. 124.) The author's results lead him to infer that camphor is a phorone in which one atom of hydrogen has been replaced by CH_3. By condensation of two molecules of acetone and one of methyl acetone he has obtained a crystallizable product agreeing with camphor in appearance, smell, and volatility.

Isoborneol. J. Bertram and H. Walbaum. (*Journ. prakt. Chem.* [2], xlix. 1–15; *Journ. Chem. Soc.*, April, 1894.) *Isoborneol*, $C_{10}H_{18}O$, is obtained by warming camphene with a mixture of acetic acid and a little sulphuric acid, and decomposing the resulting acetate by alcoholic potash. It crystallizes in laminæ, melts in a sealed tube at 212°, sublimes very easily, and dissolves in most organic solvents, but not in water. It is distinguished from borneol (obtained in the usual way from camphor and purified by conversion into its acetate) by its greater volatility, its higher

melting-point (borneol melts at 203–204° and boils at 212°), and its greater solubility in benzene and petroleum ether.

Commercial borneol was found to be a mixture of borneol and isoborneol.

Camphene in Essential Oils. J. Bertram and H. Walbaum. (*Journ. prakt. Chem.* [2], xlix. 15–19.) The authors have sought for camphene in oil of lemon, ginger oil, kerso oil, and camphor oil, by taking advantage of the ease with which it may be converted into isoborneol (preceding abstract). They have obtained isoborneol from the first three of these, but have not yet come to a decision with regard to camphor oil.

Preparation of Geraniol from Linaloöl. G. Bouchardat. (*Comptes Rendus*, cxvi. 1253–1255.) Linaloöl obtained from the oil of *Lavandula spica* is probably identical with licareol. On treatment with acetic anhydride at an ordinary temperature, it yields an acetate from which the original linaloöl can be regenerated by saponification. But if the treatment with acetic anhydride be conducted at 100–120° C., a compound is formed, which, on saponification, yields an entirely different alcohol, which is analogous to or identical with licarhodol, and has a composition corresponding to the formula $C_{10}H_{18}O$. It is neutral, optically inactive, boils at 226–231° C. with slight decomposition, has a specific gravity of 0·9061 at 0° C., and readily combines with and decolorizes bromine. This alcohol, and likewise licarhodol, thus appears to be identical with geraniol extracted from Indian oil of geranium.

Constituents of Essential Oils. P. Barbier. (*Comptes Rendus*, cxvi. 883, 993, 1062, 1200, 1459, and cxvii. 120 and 177. From *Pharm. Journ.*)

Licareol and Licarhodol.—Licareol is the name given by the author to the alcohol ($C_{10}H_{18}O$) present in the oil of licari kanali (*Licaria guianensis*), the products of which have been the subject of a series of notes in the *Comptes Rendus* (see vol. cxvi.). The oil has been described by Morin (*Ann. de Chim. et de Phys.* [5], xxv. 427) as being distilled from the wood of the plant, and known in French commerce as oil of linaloes, though it is quite distinct from the Mexican product bearing that name. Its odour is said to recall that of both rose and citron. Licareol is lævorotatory, and yields licareal or licaric aldehyde, $C_{10}H_{16}O$, and licaric acid, $C_{10}H_{16}O_2$, by oxidation. Analysis of the barium salts of the volatile acid products of the oxidation of licareol and licareal demon-

strates the absence of valerianic acid, the mixture obtained containing formic and acetic acids, with a trace of isobutyric acid. By the action of bromine, licareol forms a tetrabromide, $C_{10}H_{18}Br_4O$; when acted upon by dry gaseous hydrochloric acid, it is converted into a dichlorhydrate, $C_{10}H_{18}Cl_2$; whilst acetic anhydride causes its dehydration, an acetic ether being formed and an optically active limonene, $C_{10}H_{16}$, which the author terms licarene. On saponification of the acetic ether with alcoholic potash solution, a new alcohol, named licarhodol, $C_{10}H_{18}O$, is formed. This has a strong odour of roses, forms an aldehyde, $C_{10}H_{16}O$, having similar properties to that derived from licareol, and, also like the latter, is converted into a dichlorhydrate, $C_{10}H_{18}Cl_2$, by the action of dry hydrochloric acid gas. It is regarded, therefore, as a stable stereo-isomer of licareol. By the action of acetic anhydride licarhodol is converted entirely into its acetic ether; whereas, under identical conditions, licareol is only partly converted into the same acetic ether, licarene being at the same time formed as described above.

Coriandrol.—Oil of coriander is stated by the author to yield a hydrocarbon of the formula $C_{10}H_{16}$, an alcohol named coriandrol, and an oxygenated body not yet described. Coriandrol, when treated with acetic anhydride, gives rise to a dextro-rotatory limonene, of which the physical and chemical properties are identical with those of licarene, together with an acetic ether of a stereo-isomeric alcohol corresponding to licarhodol and apparently identical with it. The author considers, therefore, that coriandrol is but a dextro-rotatory modification of licareol. It is a colourless liquid, boiling between 92° and 93°, and differs from licareol in odour, but otherwise possesses similar properties. The aldehyde and an acid formed from it are both inactive and apparently identical with those derived from licareol, and all the evidence tends to prove that this alcohol exists in the two modifications, differing in the direction of their rotatory power but otherwise practically identical.

Rhodinol.—This isomer of geraniol is regarded as standing in a similar relation to licareol, but it yields valerianic acid by oxidation. The evidence regarding its constitution points, as in the case of licareol, to the existence of two stereo-isomers, one stable and the other the reverse, the unstable compound being transformable into the first after heating with acetic anhydride. Rhodinol submitted to this treatment formed only rhodinol-acetic ether, a colourless mobile liquid of agreeable odour, boiling at 131°. On saponification unaltered rhodinol was re-formed from this ether.

The alcohol appears, therefore, to constitute the stable modification, corresponding to an, as yet, unknown unstable one capable of conversion into the former on treatment with acetic anhydride.

Geraniol.—The author has further extended his researches on the open chain alcohols, of the formula $C_{10}H_{18}O$, by studying the geraniol extracted from the oil of *Andropogon schœnanthus*. Referring to Semmler's investigation of the constitution of this alcohol, he points out that the resulting formula seems to indicate the existence of a stereo-isomer having the same relation to geraniol as licareol to licarhodol. Acting upon geraniol with acetic anhydride, in a closed vessel at 150°, the only product was geraniol acetic ether, $C_{10}H_{17}O \cdot C_2H_3O$, a colourless liquid of agreeable odour, boiling at 129–130°. Alcoholic potash saponified this ether, producing geraniol anew, but in a purified condition, being now perfectly colourless, and having a much finer and more fragrant odour than the primitive alcohol possessed. Treated with dry hydrochloric acid gas the geraniol gave a liquid dichlorhydrate, $C_{10}H_{18}O_2$, boiling at 142-143°, and this, decomposed by means of a boiling acetic solution of potassium acetate, formed dipentene. Geraniol is therefore regarded by the author as presenting itself as the stable stereo-chemical modification, its passage through the acetic combination resulting in no isomeric change, but only in the purification of the compound. With regard to Bouchardat's claim to have transformed linaloöl into geraniol (see this vol., p. 71), he points out that if linaloöl is identical with licareol, as the former asserts, the product of the reaction described must be licarhodol (see preceding note) and not geraniol, these two alcohols being totally different both in their constitution and properties. Judging from Bouchardat's results, he is of opinion that the linaloöl of oil of spike is nothing but an unstable stereo-isomeric modification of geraniol, playing the same rôle with regard to that as licareol to licarhodol, and thus confirming and aiding in the generalization of the facts previously submitted.

Constituents of Oil of Spike. G. Bouchardat. (*Comptes Rendus*, cxvii. 1094-1096.) The author has re-investigated the oil of *Lavandula spica*, and finds it to consist chiefly of camphor and linaloöl. In addition to these it contains a small quantity of borneol and its isomerides, and of a hydrocarbon possessing all the properties of a camphene. The latter boils at 158-160° C.; it has a rotatory power of + 29° 10′, and a composition corresponding to the formula $C_{10}H_{16}$. While this camphene and the borneol occurring in this oil are both dextro-rotatory, the same constituents

occurring together in oil of valerian are stated by Oliviero to be lævogyrate.

A New Source of Rhodinol. P. Monnet and P. Barbier. (*Comptes Rendus*, cxvii. 1092-1094.) An alcohol of the formula $C_{10}H_{18}O$, identical in all its properties with rhodinol from oil of roses, has been obtained by the author from oil of pelargonium by fractional distillation under reduced pressure.

Constituents of Oil of Roses. V. Markovnikoff and A. Reformatsky. (*Journ. Russ. Chem. Soc.*, xxiv. 663-686.) Three rose oils from different parts of Bulgaria were found to liquefy completely at 23·5°, 24°, and 24° respectively, and had specific gravities of 0·8563, 0·8603, and 0·8639 at 27·5° C. They were all alike in appearance, and rotated the plane of polarization about 3·5° to the left in a 100 mm. tube.

The authors have investigated both the elæoptene and the stearoptene of this oil, and conclude from their results that the chief constituent of the former is an unsaturated normal alcohol of the formula $C_{10}H_{20}O$, isomeric with allyldipropylcarbinol and allyldiisopropylcarbinol. It boils at 220° C., and is named by them *roseol*. Eckart's statement that the principal constituent of the elæoptene of Turkish rose oil is rhodinol, $C_{10}H_{18}O$, is attributed by them to the use of impure or partially oxidized material.

The solid stearoptene obtained from the original oil by freezing constituted about 20 per cent. of the whole. It was recrystallized several times from 98 per cent. alcohol, in which it is moderately soluble, and dried first over sulphuric acid, afterwards for a short time at 100°. The purified substance melted at 36·5-36·8°, solidified at 34°, and boiled between 350° and 380°; analysis and a molecular weight determination in benzene showed that it is a saturated hydrocarbon of the formula $C_{16}H_{34}$. Small quantities of other hydrocarbons were also found to be present.

Constituents of Oil of Roses. J. Bertram and E. Gildemeister. (*Journ. für prakt. Chem.*, xl. 185-196.) The main constituent of this oil has been stated by Eckart to be "rhodinol," an alcohol of the formula $C_{10}H_{18}O$, which has subsequently also been observed by Barbier and Monnet (see above) to occur likewise in considerable quantity in French geranium oil, in which its characters are disguised by the presence of other substances. Markovnikoff and Reformatsky, on the other hand, find that the alcohol of oil of roses, which they describe under the name "roseol," appears to have a composition represented by the formula $C_{10}H_{20}O$ (see preceding abstract).

The authors have not been able to confirm the presence in rose oil of a body answering Eckart's description of rhodinol, but they find that the fractions which ought to contain this substance consists chiefly of geraniol accompanied by a small proportion of a body having a mint-like odour and thus masking the smell of the geraniol. The details of their investigation, which are fully described in their report, seem to afford proof that the products named rhodinol and roseol, and likewise Barbier's licarhodol, are not definite individual compounds, but consist of more or less impure geraniol.

Compounds of the Citral Series. F. Tiemann and F. W. Semmler. (*Pharm. Journ.*, from *Ber. der deutsch. chem. Ges.*, xxvi. 2708.) The authors describe the citral or geranial obtained from lemon oil or lemon grass oil as an aldehyde, having the composition $C_{10}H_{16}O$. It is nearly colourless, slightly soluble in water, but readily soluble in alcohol, ether, or chloroform. It is optically inactive. The optically inactive geraniol, $C_{10}H_{18}O$, is the alcohol corresponding to citral, and it is convertible into citral by oxidation with chromic acid, while it can be reproduced from citral by reduction with sodium. Optically active alcohols of the formula $C_{10}H_{18}O$ have been obtained by Eckart and Semmler—rhodinol, feebly lævo-rotatory, from rose oil; coriandrol, a dextro-rotatory unsaturated alcohol, from coriander oil; linaloöl, aurantiol, and lavendol from bergamot, petitgrain, and lavender oils; also neroloöl, the lævo-rotatory unsaturated alcohol, from neroli oil. These optically active alcohols of the formula $C_{10}H_{18}O$ all yield citral by careful oxidation. When citral is oxidized, below 0— in acetic acid solution, with chromic acid it yields methyl heptylene ketone and a substituted glyceric acid, chiefly geranic acid, $C_{10}H_{16}O_2$, in the form of a colourless oil, readily soluble in alcohol, ether, benzene, or chloroform. By destructive distillation citral yields carbonic acid and a hydrocarbon, C_9H_{16}, geraniolene, of 0·757 specific gravity at 20°, boiling at 142–143°.

Constituents of Oil of Lemon. V. Oliveri. (*Pharm. Journ.*, from *Gazz. Chim. Ital.*, and *Bull. Soc. Chim.* [3], xii. 46.) The author has examined the essential oil of *Citrus Limonum*, and describes it, when freshly prepared, as neutral in reaction, not reducing ammoniated silver nitrate, of density 0·86 to 1·60, and having a specific rotatory power varying between $[\alpha]_D = +69·75°$ and 72·10° at 16°. It oxidizes in air, becoming faintly acid, and distils entirely with the vapour of water. By fractional distillation the oil was separated into three portions. The first (constituting

one-fifteenth of the whole) passed over at 170–170·5°, and consisted of limonene, $C_{10}H_{16}$; density at $0° = 0·8867$; $[\alpha]_D = +66·82°$ at 16°. It formed a tetrabromide, $C_{10}H_{16}Br_4$, and a dichlorhydrate, $C_{10}H_{18}Cl_2$. The second fraction (nine-tenths of the total amount) distilled at 176–178°, and also consisted of limonene; density 0·899; $[\alpha]_D = +76·75°$. The third fraction distilled at 240–242°, and is described as sesquilimonene, $C_{15}H_{24}$, a viscid liquid of density 0·9847, optically inactive. This constituted a very small proportion of the oil, and formed an uncrystallizable oily tetrabromide and a similar dichlorhydrate.

Constituents of Oil of Lemon. R. S. Ladell. (*Chemical News*, lxix. 20, 21.) Commercial oil of lemon has a specific gravity of 0·860 at 15° C.; the terpene known as citrene has a specific gravity of 0·850; whilst the ordinary terpeneless oil of lemon (*i.e.*, freed from citrene) has a specific gravity of 0·900. The ordinary terpeneless oil of lemon is really a mixture of several oxygenated compounds, but by fractional distillation a liquid has been obtained which has a constant composition, an exceedingly strong odour of lemon oil, a specific gravity of 0·962, a boiling-point of 206° C., and a specific rotatory power of $[\alpha]_D = +6·42°$. Its composition corresponds to the empirical formula $C_{10}H_{18}O$.

Constituents and Properties of Indian Grass Oil. W. Dymock, C. J. H. Warden, and D. Hooper. (*Pharmacographia Indica*, iii. 557; *Pharm. Journ.*, 3rd series, xxiv. 524, 525.) The volatile oil of *Andropogon schœnanthus*, which is called in Turkish *Idris yaghi*, and also *Entershah*, and is known in Europe as *Geranium oil*, is very largely used for the adulteration of oil of roses. The oil distilled by one of the authors was dextrogyre, the ray being rotated 39° to the right by a column of 100 mm., and 78° by one of 200 mm. Some samples of the commercial oil rotated the ray about 13° to the right, and others had little or no effect upon it. The two samples examined by F. W. Semmler (*Ber. der deutsch. chem. Ges.*, xxiii. 1098), which yielded 90 per cent. of geraniol, appear to have been adulterated, as they showed a rotation of 20° to the left, whereas the genuine oil distilled by the authors was strongly dextrogyre. The colour of the genuine oil is that of pale sherry, while the commercial samples are more highly coloured. The odour resembles that of rose oil with an admixture of turpentine. The taste is pungent and agreeable, approaching that of ginger.

The authors give an interesting account of the process by which the commercial oil is obtained, and also a brief sketch of the

chemistry of geraniol ($C_{10}H_{18}O$), the chief constituent of the oil. For particulars, reference should be made to the original paper.

Constituents of Oil of Lemon-grass (Andropogon Citratus). P. Barbier and L. Bouveault. (*Comptes Rendus*, cxviii. 983 and 1154.) From the higher boiling fractions of this oil the authors have obtained an acetone of the formula $C_8H_{14}O$, possessing a strong, pleasant odour. This body varies very much in quantity in different samples of the oil, and is associated in the high boiling fraction with a terpene.

The fraction boiling at 110–115° C. contains the citriodoric aldehyde described by Dodge, for which the author proposes the name "lemonal."

The name "lemonol" is given by the authors to the alcohol contained in the essential oil of *Andropogon schœnanthus*, which they have now ascertained to be absolutely distinct from the essential oil of pelargonium. The name geraniol should therefore not be retained for the alcohol constituent of the oil of *Andropogon schœnanthus*.

Pure Geraniol. Schimmel & Co. (From the author's *Bericht*, April, 1894.) When perfectly pure this alcohol is a colourless, optically inactive liquid, having a pure and very fine odour of roses, and boiling at 230° C. It has a specific gravity of 0·882–0·885 at 15° C., and is freely and perfectly soluble both in strong and weak alcohol. It requires to be kept carefully protected from the air, owing to its liability to oxidation.

Constituents of Oil of Eucalyptus. G. Bouchardat and M. Oliviero. (*Bull. de la Soc. Chim.* [3], ix. 429–432.) The oil of eucalyptus contains aldehydes—valeraldehyde with a little hexylaldehyde and, in some samples, butaldehyde; alcohols—mainly ethyl and amyl (mostly inactive) alcohols, eucalyptol, and a lævorotatory substance, $C_{20}H_{16}$, together with a dextrorotatory substance of higher boiling-point. The examination of the latter substances is proceeding.

Constituents of Oil of Eucalyptus Globulus. E. Spizzichino. (*L'Orosi*, xvi. 1–6. From *Journ. Chem. Soc.*) 50 kilos. of the dried leaves of *Eucalyptus globulus* yield on distillation about 600 grams of oil. On prolonged boiling with alcoholic soda, the essence loses its characteristic odour, and acquires that of camphor, whilst the soda solution probably retains acetic and valeric acids, resulting from the hydrolysis of some constituents of the essence. The oil, purified by this means, boils principally at 170–180°; the fraction boiling at 170-175°, when treated with barium oxide and

fractionated, gives pure eucalyptol, $C_{10}H_{18}O$, boiling at 171–173°. It has a camphor-like odour, does not react with phenylhydrazine or hydroxylamine, and is but slightly acted on by sodium.

On heating a mixture of eucalyptol and metanitrobenzaldehyde in molecular proportion with a little dilute sulphuric acid, vigorous action occurs. The friable mass obtained on cooling, when purified by the method employed by Bertoni in similar cases (Abstr. 1891, 1378), yields *metanitrophenoleucalyptolmethane*, $NO_2 \cdot C_6H_4 \cdot CH : C_{10}H_{16}O$, as a reddish amorphous powder; it is soluble in chloroform, acetone, ethylic acetate and benzene, but insoluble in water or light petroleum. On heating, it softens and explodes slightly with evolution of yellow vapours.

Constituents of Oil of Ylang-Ylang. A. Reychler. (*Bull. de la Soc. Chim.* [3], xii. No. 9.) This oil has a rotatory power of $[\alpha]_D = -20{\cdot}7$ and a specific gravity of 0·886 at 15° C. Its principal constituent is an alcohol of the type of geraniol, having a composition represented by the formula $C_{10}H_{18}O$.

Constituents of Oil of Hops. A. C. Chapman. (*Proc. Chem. Soc.*, No. 127.) About 80 kilos. of hops, some of which had been grown in Burgundy, some in Alsace, and the remainder in Kent and Sussex, were submitted to steam distillation in quantities of about 1 kilo. at a time.

When the greater part of the oil had been prepared, the author was compelled, owing to pressure of other work, to discontinue its examination, and it was placed aside in a well-stoppered bottle, which it filled; at the end of about 10 or 11 months, the remainder of the oil (about 30 c.c.) was prepared, and the whole was then twice steam distilled to free it from resin; about 140 c.c. were obtained. On submitting the oil to distillation it commenced to boil at 170°, the thermometer rapidly rising to 230°, the greater part distilling over between 230° and 270°. After several fractionations, finally over sodium, about 40 c.c. of oil were obtained, boiling between 256° and 261° (uncorr.). This was found, on examination, to be a sesquiterpene, three combustions giving numbers closely agreeing with those required by the formula $C_{15}H_{24}$.

Two vapour density determinations by Hofmann's method gave 6·91 and 7·1, the vapour density required by $C_{15}H_{24}$ being 7·1. The boiling-point of the sesquiterpene corrected for the emergent mercurial column was 261–265°. Its relative density was found to be 0·8987 at 15°/15°, and 0·8955 at 20°/20°; when

examined in a tube 100 mm. long at 20°, it produced a rotation of 1° 5′ to the right, corresponding to a specific rotatory power of + 1·2°.

Its index of refraction for the red hydrogen line, *h*Hα, was 1·4978, corresponding to a specific refractive energy of 0·555.

Another freshly distilled sample of hop oil which was examined soon after its preparation was found to boil at much lower temperatures, and consisted of lower boiling-point terpenes, together with an oxygenated constituent, and contained but little of the sesquiterpene. It is proposed both to continue the study of the sesquiterpene and to examine in detail the other constituents of oil of hops, in the hope of gaining some insight into the nature of the changes which occur during the ageing of the essential oil.

Constituents of the Oil of Erigeron Canadense. F. W. Meissner. (*Amer. Journ. Pharm.*, 1893, 420–426.) The author's results confirm the statement that Erigeron oil consists chiefly of dextrogyrated limonene. Pinene is not found to be present. The principal constituent of the oil besides limonene appears to be a high boiling substance, probably aldehyde-like in character, since it is readily decomposed, and polymerizes. In order to isolate this substance, other methods than fractional distillation under ordinary pressure must be resorted to.

Occurrence of Myrosin in Capparidaceæ and Tropæolaceæ. L. Guignard. (*Comptes Rendus*, cxvii. 493, 587, 751, and 861.) The author finds that the caper plant (*Capparis spinosa*) and other members of the *Capparidaceæ* contain numerous ferment cells similar to those observed in *Cruciferæ*, and that the reactions of the cell contents are identical with those of myrosin. The ferment exists chiefly in the flower and pulp of the fruit. Capers are rich in these ferment cells, and likewise contain a glucoside, the decomposition of which takes place under the influence of the myrosin in the same manner as in *Cruciferæ*.

Myrosin has also been observed by the author in all the organs of plants belonging to the order *Tropæolaceæ*. It is localized in these in cells distinct from those containing the glucoside. Like in *Cruciferæ* and *Capparidaceæ*, the essential oil yielded by plants of this order does not pre-exist in them, but is formed by the action of the ferment on the glucoside. A similar ferment has also been observed in various organs of plants belonging to the *Limnanthaceæ* and *Resedaceæ*.

Presence of Myrosin in Carica Papaya and other Species. L. Guignard. (*Comptes Rendus*, cxviii. 545.) *Carica papaya* and a number of other species of this genus are found by the author to contain the ferment myrosin, and also a glucoside analogous to the myronate of potassium of *Cruciferæ*, with which it reacts in a similar manner in the presence of water, yielding essential oil. Papaïn has no share in this reaction, and occurs chiefly in those organs which are poorest in myrosin.

The author's observation respecting the occurrence of myrosin in these plants is of special interest, as the *Papayaceæ* are in no wise allied to the *Cruciferæ* or to the other orders in which this ferment has hitherto been detected.

Localization of Vegetable Enzymes. J. R. Green. (*Science Progress*, June, 1894.) In plants, as in animals, a process of digestion takes place, being effected by the agency of enzymes or ferments, which seem to be formed entirely with a view to the utilization of the deposited reserve materials. As regards the localization of the ferment-containing tissue, the ferment, in the simplest cases of secretion, is formed in the same cell as its appropriate reserve material. In comparatively low vegetable growths, the enzyme is probably co-terminous with the cell protoplasm. In higher plants, however, more approach to specialization is seen, though even among these there are conspicuous cases of a very wide distribution, as in the case of diastase. The ferment and the glucoside on which it works are always enclosed in different cells. In roots they are distributed chiefly in the cortex, but sparsely in the wood. The pericycle and the tissue derived from it form their chief seat, the secondary bast coming next in order. They may also be found in the medullary rays and pith. In leaves the secreting cells occur throughout the mesophyll, but may be localized either there, in the pericycle, or in the bast of the veins, and occasionally occur in the endodermis of the bundles. In flowers secreting cells are contained in large numbers in both sepals and petals, but they are most numerous in the pulp of the fruit, whilst in seeds they may occur in the embryo and integument, in the parenchyma of the cotyledons, and in the lower epidermis when the cotyledons become green.

A Ferment in Penicillium Glaucum resembling Emulsin. E. Gérard. (*Journ. de Pharm.* [5], xxviii. 11, 12.) On macerating this mould with water, concentrating the resulting solution in a vacuum, and precipitating by means of absolute alcohol, a mixture of ferments was obtained which, after purification, was found to

invert cane-sugar, to convert starch into sugars, and, in addition, to completely hydrolyse amygdalin and salicin. With the former glucoside it yielded hydrocyanic acid, essential oil of bitter almonds and glucose, while with the latter it gave rise to the formation of glucose and saligenin. From these results the presence of a ferment resembling or identical with emulsin is inferred.

Presence of a Diastatic Ferment in Green Leaves. S. N. Vines. (*Annals of Botany*, v. 409–412.) Wortmann attributed the saccharification of starch occurring in green leaves and stems to the action of the living protoplasm, since he was unable to confirm the presence in them of a diastatic ferment. The author has reinvestigated this matter, and describes a number of experiments the results of which seem to afford satisfactory proof that a real diastatic ferment does exist in green leaves. Details of the experiments are given in the paper.

Substitution of Strontium for Calcium as Plant Food. E. Haselhoff. (*Landw. Jahrb.*, xxii. 851–861.) The author's results indicate that strontium has no injurious action on plants; that it is taken up by plants, and seems to take the place of lime; and that it replaces lime only when the supply of lime and other substances are no longer adequate for the wants of the vegetable organism.

Substitution of Strontium for Calcium in the Animal Organism. H. Weiske. (*Landw. Jahrb.*, xxiii. 119–123; *Journ. Chem. Soc.*, May, 1894.) The author finds that, though strontium salts are not poisonous, their conveyance in the place of calcium compounds to the flesh and bone of animals by their substitution in the food cannot be carried on very long without fatal results, and that, in a physiological sense, strontium cannot therefore be regarded as a substitute for calcium in the animal organism.

Pancreatic Ferments. A. Dastre. (*Comptes Rendus Soc. Biol.*, 1893, 648–651.) The results of the author's experiments indicate the independence of amylopsin and trypsin, the two principal ferments occurring in pancreatic juice. Various hypotheses are suggested as possible explanations.

Action of Papaïn as a Digestive Ferment. M. Sittman. (*Münch. Med. Wochenschr.*, xl. 548.) The author reports favourably on the digestive action of papaïn, and on its value as a remedy in acute gastritis. He recommends it to be administered in doses of 0·05 gram immediately after each meal. In his experiments on coagulated white of egg he found 0·01 gram of papaïn sufficient to

convert 10 grams of the former, mixed with 100 c.c. of water at a temperature of 40–45° C., into an opalescent milky fluid containing no unchanged albumen within two hours. He has used it in neutral, alkaline and faintly acid fluids with equal success.

Papaïn and Papaïn Digestion. G. Sharp. (*Pharm. Journ.*, 3rd series, xxiv. 633–635.) Commercial papaïn is in some instances faintly acid, owing perhaps to some slight decomposition. The acidity, however, does not affect the activity of the ferment. The author has found no specimen entirely soluble, either in water or in weak alkaline solutions. The insoluble portion, on being well washed with water, dried, and treated with strong nitric acid, dissolved, forming a yellow solution (xantho-proteic reaction); and another portion, to which strong nitric acid and mercuric nitrate (Millon's reagent) were added, gave a red coloration. Digestion with active solution of pepsin for one hour showed no change. From its behaviour towards solution of sodium chloride and other observations the author concludes that the insoluble part consists mostly of dysalbumose. The true nature of papaïn is unknown, but the commercial article gives reactions for the various albumoses, chiefly deutero-albumoses, and with the latter the true ferment may be united. Different samples vary as to the relative proportion of the various albumoses. Nothing of the nature of a peptone is present. Leucine and tyrosine may be found, but are of no special importance. Carpaïne, a principle contained in *Carica Papaya*, does not appear to occur in Finkler's papaïn. When papaïn is added to coagulated albumen, the various decomposition products, referred to below, appear in infinitely larger amounts than is consistent with their existence in the quantity of papaïn employed; hence the assurance that they are the result of the action of the ferment.

The author has closely investigated the nature of papaïn digestion, and arrives at the conclusion that the following products are formed in this process:—

1. Globulose
2. Proto-albumose } traces.
3. Hetero-albumose
4. Deutero-albumose, abundant.
5. Dysalbumose and undigested matters.

Peptone is entirely absent among these products.

The complete absence of peptone may be regarded as the chief feature of this investigation, and is in accord with an observation

by S. Martin (*Year-Book of Pharmacy*, 1886, 98), while it is in direct opposition to statements published by A. Wurtz, A. Poehl, E. G. Clayton, J. R. Green, and others. Full details as to the manner in which the author's results were obtained will be found in the original paper.

The Action of Papaïn on Egg, and Serum Albumen in Acid and Alkaline Solutions. G. Sharp. (*Pharm. Journ.*, 3rd series, xxiv. 757–759.) Exception has been taken to the author's previous results (preceding abstract), on the ground that he experimented entirely with egg-albumen and not also with serum-albumen, and that he had not tried the action of the ferment in alkaline and acid fluids. In the present research he carried on two sets of experiments, one with egg-albumen, the other with serum-albumen, carefully prepared from meat, all fat being removed, so that a light amber-coloured jelly was obtained. In each case papaïn was tried in neutral solution, in 0·0384 per cent. hydrochloric acid solution, and in 0·250 per cent. sodium carbonate solution, and in all cases one part of albumen, one-tenth part of papaïn, and 100 parts of water were employed, except, of course, where acid or alkali was used, in which case solutions of these took the place of water. The temperature of 35° C. usually observed was employed in all cases, and maintained for some hours. In no case was peptone present, trial being made both by the ammonium sulphate process and by dialysis.

Egg-albumen was found by the author to be acted upon much more readily by pepsin than by papaïn; but even with pepsin very little peptone was formed under the most favourable circumstances, the greater part of the soluble product being proteose. With reference to experiments of this kind, attention is called by the author to several precautions to be observed in order to avoid fallacious results, and more especially to the necessity of thoroughly purifying the membrane used for dialysis.

The paper terminates with the following conclusions:—Papaïn is a ferment which acts on weak proteïds, resolving them into soluble proteids, the final result being a proteose; the peptone stage is never reached. Pepsin (and pancreatin very slowly) acts on the strongest proteïds, and finally, but slowly and with great difficulty outside the body, transforming the sparingly soluble albumen into the highly soluble peptone. Papaïn is a product of the vegetable kingdom, and the ferment possibly exists for the purpose of enabling the plant to break up vegetable albumen into soluble albumose, which has to pass through the simple

vascular system of the plant. Pepsin is a product of the animal kingdom, and has for its final action the formation of peptone, which has to pass by osmosis through the animal membrane and into, not a primitive vascular system like that of the plant, but into the elaborate circulation, upon which is dependent for nourishment the complex nervous system of the animal.

There are many points of interest in the details given by the author, both in this paper and the one referred to in the preceding abstract, for which reference should be made to the original reports.

Comparative Digestive Action of Papaïn and Pepsin. D. B. Dott. (*Pharm. Journ.*, 3rd series, xxiv. 758, 759.) The author describes a number of experiments, the results of which lead him to the following inferences:—Papaïn has only a slight solvent action on albumen at the temperature of the body, and practically no peptonizing effect. Pepsin, on the other hand, possesses in a high degree the power of dissolving albumen, and is capable of peptonizing the solutions. The higher temperature of 130° F. (recommended in the official directions for testing pepsin) increases the rapidity both of the solvent and peptonizing power of pepsin, and likewise increases the solvent power of the papaïn.

Notes on Papaïn Digestion. S. Rideal. (*Pharm. Journ.*, 3rd series, xxiv. 845–847.) The author refers to the conflicting nature of the statements published by different investigators with regard to papaïn digestion and the products resulting therefrom. To some extent the discrepancies alluded to are attributable to a want of uniformity of the papaïn experimented with, and to variations of temperature employed, but a more obvious cause seems to consist in the use of fluids of different strengths. It is pointed out that the activity of papaïn is undoubtedly greater if the amount of water is less and the proportion of proteïd greater than the relative proportions with which pepsin proves most active, so that parallel experiments conducted with these two enzymes will give different results from these causes alone. One part of papaïn is found to be capable of digesting 100 parts of wet fibrin or egg albumen at the temperature of the human body, provided that the quantity of water present does not exceed three times the weight of the proteïd used. Sharp, however, has used as much as 10 per cent. of the enzyme, and allowed the digestion to proceed in a quantity of liquid amounting to 100 times the weight of proteïd. The author gives an interesting and detailed account of a number of experiments with both meat fibrin and egg albumen, fully

proving that there is a decided difference in the behaviour of papaïn when the amount of liquid is varied, and also with different ratios of papaïn to undigested proteïd. In a weak solution the digestion does not appear to proceed to the full extent, and neither peptone nor deutero-albumose is produced in notable quantity. In strong solutions, however, evidence is readily afforded that the digestion by papaïn proceeds further than the deutero-albumose stage, and that peptone in appreciable quantity is produced. In each set of experiments the products of digestion were dialysed, and the dialysate subsequently examined for peptone by means of the biuret reaction (with copper sulphate and caustic soda). In one instance the presence of peptone was further confirmed by the addition of nitric acid to some of the undialysed liquid, which gave a copious yellow precipitate, but none with the same solution after dialysis. Wenz's process for separating small quantities of peptone from the allied proteïds existing in the digested solution was also tried, and likewise gave evidence of the presence of peptone. The author prefers, however, to rely on the quick diffusion through a dialyser as the best means for its separation. At the same time he considers that the determination of total nitrogen before and after treatment with ammonium sulphate ought to give useful information respecting the ratio of the albumoses to further products of digestion, and he intends to continue his researches in this direction.

The present investigation thus proves that under suitable conditions peptone is formed as one of the products of papaïn digestion, and therefore confirms the opinions expressed on this subject by Wurtz, Poehl, Clayton, and Green.

Papaïn. M. Hobein. (*Pharm. Zeit.*, xxxix. 386.) The author concludes from his experiments that the papaïn met with in trade is of two kinds, the one active only in alkaline liquids, while the other one is active in acid liquids. The peptonizing action in acid liquids takes place more readily when 0·2 per cent. hydrochloric acid is used, and in such an acid liquid a dilute solution of papaïn is more efficient than a stronger solution. The effect produced is lessened when the amount of acid is increased or reduced, and it is increased by a rise of temperature to about 60° C. In alkaline liquids the action is still more effectual, and the strength most favourable to it corresponds with 0·1 per cent. of caustic soda. In a solution of sodium carbonate of equivalent strength there is very little action, especially upon fibrin. Judging from experiments made with papayotin, prepared from the fresh

juice of *Carica papaya*, it is inferred that those preparations which act only in alkaline liquids contain pure papayotin, and that those which are active in acid liquids are mixed with pepsin. This view, however, is opposed to the observations of Willmack, Hansen, and other investigators, who have all confirmed the action of the plant juice in acid liquids. It remains for further investigation to ascertain a satisfactory means of detecting the presence of pepsin, and of deciding the question whether the papaïn preparations which are active in acid liquids really contain an admixture of pepsin, or whether the juice of the plant contains various ferments which act differently.

Note on the So-called "Artificial Diastase." J. V. Egoroff. (*Journ. Russ. Chem. Soc.*, xxv. 83-86.) The author has experimented with gluten solutions containing 0·2 per cent. of potassium phosphate (K_2HPO_4) and 0·1 per cent. of acetic acid respectively, and arrives at the conclusion that the greater power possessed by these over ordinary aqueous solutions is not due to any further formation of diastase or any similar ferment, but probably to the development of a bacterium capable of effecting this fermentation.

This view is confirmed by N. Lubavin (*Journ. Russ. Chem. Soc.*, xxv. 86–90).

Influence of Tea and Coffee on Digestion. C. Schultz-Schultzenstein. (*Zeitschr. für physiol. Chem.*, xviii. 131, 132.) The experiments described show that infusions of tea and coffee, when mixed with an artificial gastric digestion in amounts approximately equal to that which would occur in the stomach after a meal accompanied by tea or coffee, impede digestion. The amount digested without such addition being 94 per cent., that in the specimens mixed with tea and coffee varied from 61 to 68 per cent.

Influence of Chloroform on Artificial Gastric Digestion. M. Dubs. (*Virchow's Archiv*, cxxxiv. 519-540.) The author's experiments were undertaken with the object of testing the accuracy of E. Salkowski's statement that chloroform, though possessing the power of killing organized ferments, exercises no disturbing effect on the action of digestive and other purely chemical ferments. This view had been already called in question by Bertels, who found that under certain circumstances chloroform impairs the activity of pepsin in artificial digestion mixtures. The results of the author's experiments lead to the following conclusions:—Chloroform, in small quantity, increases the activity of pepsin in acid solutions, but hinders it when used in larger proportion,

owing, as it appears, to the fact that the presence of chloroform in larger quantities causes precipitation of the pepsin. The same holds true for hydrochloric acid extracts of the gastric mucous membrane, except that a greater concentration of chloroform (0·6 to 0·7 per cent.) is necessary to produce the impeding effect on the fermentative action. This difference is accounted for by the presence of proteïd matter in the extracts of the mucous membrane.

Presence of Potassium Sulphocyanide in the Stomach. G. Kelling. (*Zeitschr. für physiol. Chem.*, xviii. 397–408.) Potassium sulphocyanide has been recognised by the author in the contents of the stomach, and its occurrence therein is accounted for by the supposition that it emanates from the swallowed saliva. It is pointed out that the presence of this salt is a source of error in Uffelmann's reaction for lactic acid.

Changes of Arsenious Acid in the Organism. D. Vitali. (*L'Orosi*, xvi. 73–87.) Arsenious acid is converted by the organism into arsenic acid, which is eliminated with the urine in a state of organic combination. Neither arsenious nor arsenic acid combines with albumen to form albuminates. In the author's opinion arsenic can replace phosphorus in lecithin.

Proteïds of Milk. M. Arthus. (*Arch. de Physiol.*, 1893, 673–677.) Milk is shown by the author to contain a lactalbumen and lactoglobulin, which differ from caseïnogen in being coagulable by heat. Details of experiments will be found in the original paper.

Phosphorus and Sulphur in Caseïn. A. Béchamp. (*Comptes Rendus*, cxvii. 1085–1088.) Phosphorus and sulphur are essential constituents of caseïn, and exist in it in organic combination. The amount of the former in different samples of carefully purified caseïn was found to be 0·74 to 0·76 per cent., and that of the sulphur 0·04 to 0·046 per cent. In order to estimate these elements in caseïn, a known weight of the dried substance is mixed with a standard solution of bismuth nitrate, evaporated to dryness, dried at 110°, and afterwards heated to dull redness. The difference between the total weight of the residue and the weight of the bismuth oxide gives the weight of the sulphuric and phosphoric acids.

Albumose. H. Schrötter. (*Monatshefte*, xiv. 612–623. From *Journ. Chem. Soc.*) The author has prepared from Witte's commercial peptone an albumose, which is soluble in and crystallizes from

alcohol, is practically ashless, and furnishes a hydrochloride of constant composition. The method employed is as follows:—The peptone is boiled with absolute methylic alcohol in a reflux apparatus, by which soluble impurities are removed. The residue is dissolved in water containing sulphuric acid, and is treated with zinc dust and sulphuric acid, the latter being added a little at a time. After remaining several days, and being warmed for four hours in a water-bath, the solution is filtered, the sulphuric acid removed by excess of baryta, the clear solution saturated with carbonic anhydride, concentrated, again filtered, and eventually evaporated to dryness in a vacuum over sulphuric acid. The residue is exhausted with hot methylic alcohol, the extract concentrated, and the albumose precipitated with absolute ether. In order to obtain an ashless preparation, the albumose is subjected to treatment by Paal's process. The albumose dissolves readily in water and methylic alcohol; is sparingly soluble in cold alcohol; gives the biuret reaction characteristic of albumoses and peptones; is precipitated by tannin, mercuric chloride, ammonium sulphate, and sodium chloride; and contains, after allowing for 0·22–0·5 per cent. of ash, C 50·5–51·3, H 6·4–7·0, N 16·5 17·1, S 1·1 per cent. The *hydrochloride* contains C 47·2–48·5, H 6·5–7·3, N 14·6–14·7, S 0·9 1·1, HCl 10·5 11·0 per cent. The molecular weight of the albumose, as determined by Raoult's method, in aqueous solution, was found to be between 587 and 714; whereas, if it be supposed that the molecule contains at least 1 atom of sulphur, the molecular weight, as deduced from analysis above, cannot be less than 2,000. In behaviour and composition the substance closely resembles the protalbumose described in *Beilstein's Handbuch*, 3, 1304. On benzoylation, the albumose gives two products, of which one (C 60·8, H 5·8–6·0, N 12·6–12·8, S 0·9 per cent.) is crystalline, insoluble in alcohol, and yields on hydrolysis 19·7 per cent. of benzoic acid; and the other (C 59·3–59·9, H 6·1–6·4, N 12·3 11·9 per cent.) is soluble in cold alcohol, contains apparently no sulphur, and yields on hydrolysis 17·5–18·6 per cent. of benzoic acid.

Ovomucoid. C. T. Mörner. (*Zeitschr. für physiol. Chem.*, xviii. 525–532.) The body described by the author under this name is a proteïd-like substance obtained from white of egg after the removal of albumen and globulin, and appears to be identical with Neumeister's pseudopeptone. It contains 12·65 per cent. of nitrogen. When boiled with dilute hydrochloric acid it yields a reducing substance.

Synthesis of Hæmoglobins. H. Bertin-Sans and J. Moitessier. (*Bull. de la Soc. Chim.* [3], ix. 721.) Hæmoglobins have been formed by combining hæmatins and proteïd substances obtained from the blood of sheep and fowls, both when the two constituents have been obtained from the blood of one animal species, and when each constituent has had its origin in a different one of the three sources—cattle, sheep, and fowls.

Episarkine. G. Salomon. (*Zeitschr. für physiol. Chem.*, xviii. 207–212.) This name is applied by the author to a new xanthine-like compound isolated by him from urine. It had been observed by him on several occasions in the urine of leucæmic patients and in that of pigs and oxen. The body in question is still under examination, and further details are promised.

Constitution of Hypoxanthine and Adenine. M. Krüger. (*Ber. der deutsch. chem. Ges.*, xxvi. 1914–1922; *Journ. Chem. Soc.*, December, 1893.) From analogy with uric acid and xanthine, one of the following formulæ is deduced for hypoxanthine,

```
NH·CH:C·NH              N—CH·C·NH
|     |    >CO   or     ||     |    >CO, that of adenine
CH:N——C══N              CH·NH·C══N
```

being obtained from these by replacing O by NH. Either of these two formulæ also explains the following facts, recently observed by the author. Bromohypoxanthine forms a tetrabromo-additive compound; and, when oxidized with hydrochloric acid and potassium chlorate, yields carbamide and mesoxalylcarbamide. Dimethylhypoxanthine represents the maximum of substitution (of methyl for hydrogen), and, when hydrolyzed with dilute sulphuric acid, yields methylamine and methylamidoacetic acid.

Choline, Neurine, and Allied Compounds. E. Schmidt. (*Pharm. Journ.*, from *Annalen der Chemie*, vol. cclxvii.) On comparing the chemical constitution of trimethylamine derivatives with their physiological action, it is evident that apparently slight chemical differences are accompanied by essential differences in their action upon the animal organism. Thus choline, $C_5H_{15}NO_2$, and betaine, $C_5H_{13}NO_3$, are comparatively innocuous, while muscarine, $C_5H_{15}NO_3$, and neurine, $C_5H_{13}NO_3$, are intensely poisonous.

Choline and betaine bear the same relation to each other as a primary alcohol to the corresponding monobasic acid. Muscarine, an intermediate product of the oxidation of choline, has properties which place it between choline and betaine as an aldehyde, while neurine differs from choline only by containing one molecule less of H_2O.

Choline.

$$(CH_3)_3 \cdot \underset{\displaystyle OH.}{\underset{|}{N}} \cdot CH_2 - CH_2 \cdot OH$$

Betaine.

$$(CH_3)_3 \cdot \underset{\displaystyle OH.}{\underset{|}{N}} \cdot CH_2 - CO \cdot OH$$

Muscarine.

$$(CH_3)_3 \cdot \underset{\displaystyle OH.}{\underset{|}{N}} - CH_2 - CH(OH)_2$$

Neurine.

$$(CH_3)_3 \cdot \underset{\displaystyle OH.}{\underset{|}{N}} \cdot CH = CH_2$$

If muscarine is really an aldehyde, the toxic character of that base would appear to be due to the presence of the aldehyde group $-CH_2-COH$, or the group $-CH_2-CH(OH)_2$, since the groups $-CH_2-CH_2 \cdot OH$ and $-CH_2-CO \cdot OH$, in combination with trimethylamine, have no direct poisonous action. In the case of neurine, on the contrary, it is probable that the poisonous action may be connected with the double linking in the vinyl group $-CH=CH_2$. And if that idea be correct, it might be expected that a corresponding trimethylamine derivative with a triple linking—an acetenyl-trimethyl ammonium hydroxide—

$$(CH_3)_3 \cdot \underset{\displaystyle OH}{\underset{|}{N}} \cdot C \equiv CH$$

should have a similar or even a stronger toxic action.

In order to test this inference, the acetenyl compound was prepared. Its physiological action has been tried by Professor Hans Meyer, and it proves to be a very powerful poison, acting even more energetically than neurine.

The material taken as the starting-point in these experiments was the trimethylamine-ethylene bromide, $Br\,N\,(Me)_3 \cdot C_2H_4\,Br$, obtained by A. W. Hofmann by combining ethylene bromide with trimethylamine. When treated with moist silver oxide both bromine atoms are separated, the one combined with carbon being eliminated as hydrobromic acid, and consequently giving rise to a double linkage of the carbon atoms so as to form trimethyl-vinyl ammonium hydroxyd or neurine. By the action of bromine upon the bromide of this base the double linkage of the carbon atoms is broken, and a compound formed which may be described as dibromethyl-trimethyl ammonium bromide, $Br\,N\,Me_3 \cdot CH\,Br - CH_2\,Br$. By the treatment of this product with alcoholic potash hydrobromic acid is eliminated, and the double linkage of the carbon atoms is restored, monobrom-vinyl-trimethyl ammonium bromide, $Br\,N\,Me_3\,CH = CH\,Br$, being formed. By further reaction with

alcoholic potash hydrobromic acid was again eliminated, resulting in a triple linkage of the carbon atoms and the formation of acetenyl-trimethyl ammonium, $OH \cdot NMe_3 \cdot C{\equiv}CH$, as shown by the following equation:—

$$\left.\begin{matrix} BrNMe_3 \cdot CH{=}Br \\ 2KHO \end{matrix}\right\} \quad \left\{\begin{matrix} OH \cdot NMe_3 \cdot CC{\equiv}H \\ 2KBr + H_2O. \end{matrix}\right.$$

Extending the inquiry as to the physiological action of these compounds, it appeared of interest to obtain a knowledge of the homologues of neurine, and in the first instance allyl-trimethyl ammonium hydroxide, $C_6H_{15}NO$, has been studied by Weiss and Partheil, the constitution of which is shown by the following formula:—

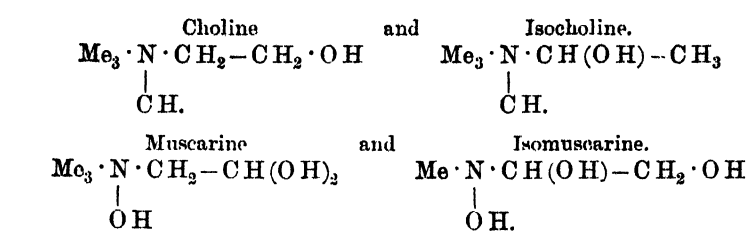
$$(CH_3)_3 \cdot N(OH) \cdot CH_2 - CH{=}CH_2$$

This body was prepared by the reaction of allyl chloride, C_3H_5Cl, with an alcoholic solution of trimethylamine, $N(CH_3)_3$, heated together for six hours in a sealed tube. The chloride thus obtained was very hygroscopic; its platinum salt was readily soluble in water, and crystallizable. Contrary to expectation, its physiological action was found to be quite different from that of neurine or of the acetenyl base above mentioned, being, in fact, a comparatively non-poisonous substance.

It has not been possible to obtain from this allyl compound a derivative corresponding to acetenyl-trimethyl-ammonium hydroxide. The product obtained had not very marked toxic characters, and its probable constitution is represented by the formula—

$$Me_3 \cdot N(OH) \cdot CH\begin{matrix} CH \\ \| \\ CH. \end{matrix}$$

Further investigations of the compounds obtainable by similar reactions are being carried out by the author and his pupils. From the relations existing between the chemical and physiological characters of choline, betaine, and muscarine, it is of interest to ascertain in regard to their physiological action what is the influence exercised by the position and the number of the hydroxyl groups in the derivatives of trimethylamine. This has been attempted in reference to—



It has not hitherto been possible to obtain isocholine; but the preparation of isomuscarine or oxycholine has not been attended with any great difficulty. It appears from the experiments carried out by Meyer that the physiological effects of this latter body show that the product obtained from choline by the introduction of a hydroxyl group in the α position has a powerful toxic character, but that its action is essentially different from that of muscarine, in which the second hydroxyl group is apparently in the β position.

Ptomaïnes. A. Garcia. (*Zeitschr. für physiol. Chem.*, xvii. 543–595; *Journ. Chem. Soc.*, September, 1893.) In putrefying mixtures of horseflesh and pancreas, hexamethylenediamine, $C_6H_{16}N_2$, occurs in addition to the diamines already described.

Ptomaïnes may be best estimated by Baumann's benzoic chloride method. In mixtures, the presence of sugar reduces the formation of diamines to about half; the same diamines are, however, formed.

The production of putrescine, cadaverine, and hexamethylenediamine is an early phenomenon in such putrefying mixtures at a favourable temperature; it reaches its highest point within about three days, and they are produced in the same proportion throughout. In cystinuria tetramethylenediamine only is produced in the later stages. Feeding on cheese causes an increase, on carbohydrate a diminution, in diamine production. Infection of nutritive media with the fæces of such patients causes the appearance of ptomaïnes. In media not so infected, exclusion of air hinders the formation of diamines during the first few days.

A New Ptomaïne. C. Lepierre. (*Comptes Rendus*, cxviii. 476.) The ptomaïne in question was obtained from a cheese undergoing decomposition, and has a composition answering to the formula $C_{16}H_{24}N_2O_4$. It is described as a crystalline, bitter, odourless solid, slightly soluble in water and readily so in alcohol, forming crystallizable salts and having a rotatory power in aqueous solution of $[\alpha]_D = +11{\cdot}3°$. Solutions of its salts are not

precipitated by tannin, but form precipitates with most of the other alkaloid reagents. It is stated to possess toxic properties.

A Ptomaïne from the Urine of Cancer Patients. A. B. Griffiths. (*Comptes Rendus*, cxviii. 1350.) The author has isolated from the urine of cancer patients a highly toxic ptomaïne of the formula $C_8H_5NO_5$, which does not occur in normal urine. It crystallizes in colourless delicate needles, which are soluble in water, alkaline to test-paper, and forms salts with acids and precipitates with the usual alkaloid reagents. The precipitates produced with Nessler's solution and phosphomolybdic acid are brown, that with phosphotungstic acid yellow, and that with mercuric chloride grey. With silver nitrate it produces a characteristic red precipitate. The name "cancerine" is proposed for this body.

Cause of the Characteristic Odour of Urine after eating Asparagus. M. Crouzel. (*Pharm. Centralhalle*, xxxv. 217.) The well-known peculiar odour of urine always noticed after eating asparagus is attributed by the author to a volatile oil which can be extracted from such urine and also direct from asparagus.

Chlorine Compounds in Urine. A. Berlioz and E. Lépinois. (*Journ. de Pharm.*, xxix. 288–296.) The authors point out that urine contains organic chlorine compounds as well as mineral chlorides, and that this fact should be taken into consideration in determining the variations in the amount of chlorine in healthy and pathological urines.

A Sensitive Test for Albumen in Urine. E. Spiegler. (*Chem. Centr.*, 1893, i. 368.) The author has previously published a very delicate test for albumen (see *Year-Book of Pharmacy*, 1892–94), and now recommends a slight modification in the mode of preparing the reagent, consisting in the substitution of glycerin for sugar. The test will admit of the detection of 1 part of albumen in 250,000 parts of urine. Iodides interfere with the reaction, but bromides do not.

The Ferrocyanide Test for Albumen in Urine. J. P. Karplus. (*Chem. Centr.*, 1893, ii. 496.) The yellow coloration occasionally observed when testing urine for albumen by means of potassium ferrocyanide in the presence of acetic acid is shown by the author to be due to nitrites, which, though not occurring in fresh urine, can be frequently detected in this liquid after it has been kept for more than twenty-four hours. It is considered probable that these nitrites are formed from nitrates by the action of a bacterium.

When nitrites occur in the urine of patients taking iodides, free iodine has been observed to be present at the same time.

Detection of Nitrites in Urine. A. Jolles. (*Zeitschr. für analyt. Chem.*, xxxii. 762–766.) The author does not consider the usual test for nitrites with potassium iodide and starch as sufficiently delicate for the detection of minute traces in urine, owing to the absorption of iodine by normal and pathological constituents of the latter. He therefore prefers to rely on the reaction with sulphanilic acid and α-naphthylamine or on Schäffer's reaction.

The urine is first decolorized by warming to 40° and shaking with a small quantity of animal charcoal. 100 c.c. are then placed in a stoppered cylinder, acidified with sulphuric acid, then treated with 1 c.c. of sulphanilic acid, and, after a few minutes, with 1 c.c. of α-naphthylamine. The cylinder is then stoppered air-tight and allowed to stand, when the characteristic rose-red colour will develop more or less quickly according to the quantity of nitrite present.

In order to apply Schäffer's test, 3 c.c. of the decolorized urine are mixed in a test-tube with an equal volume of 10 per cent. acetic acid and 2 drops of solution of potassium ferrocyanide (1 in 20). The presence of nitrites is then indicated by the production of a yellow coloration due to the formation of ferricyanide.

Test for Glucose. A. Jaworowsky. (*Pharm. Post*, 1893, 549.) On boiling about 4 c.c. of a solution of glucose with 0·12 gram of iodic acid and 0·4 gram of sodium hydrate for one minute, allowing to cool, then acidifying with dilute hydrochloric acid, and carefully pouring ammonium hydrate down the side of the inclined test-tube so as to form a separate stratum, a dark-coloured precipitate of iodide of nitrogen is produced at the line of contact between the two layers of liquid. This test is stated to be characteristic for glucose, and to be unaffected by ketones and aldehydes in general. It is also recommended for the examination of urine, as none of the normal constituents of the latter produce the reaction.

Detection and Estimation of Sugar in Urine by Means of Methylene-Blue. N. Wender. (*Journ. Chem. Soc.*, from *Chem. Centr.*, 1893, 670.) Ihl observed that methylene-blue is decolorized by reduction to the leuco-compound, by invert-sugar, dextrose, dextrin, etc., whilst it is not acted on by cane-sugar. Urea, uric acid, and the inorganic salts in urine are without action on methylene-blue; creatinine decolorizes it with tolerable rapidity,

creatine after boiling for some time, and albumen when it is present to the extent of some tenths of a per cent. Animal gum and glycuronic acid may also decolorize methylene-blue; concentrated alkalies decolorize it rapidly with separation of the free base, but dilute alkalies do not produce any effect. All normal urines in the undiluted state decolorize alkaline methylene-blue solutions on heating; 1 c.c. normal undiluted urine decolorizes 1 c.c. of methylene-blue solution (1 : 1,000). To decolorize the same amount of methylene-blue, about 4·5 c.c. of 10 times diluted normal urine are required, whilst 1 c.c. of a similarly diluted diabetic urine, containing 0·5 per cent. of sugar, is sufficient to produce the same effect. In order to detect the presence of sugar in urine, the following method is adopted:—5 or 10 c.c. of the urine is diluted to 10 times its volume; 1 c.c. of this solution is then treated with 1 c.c. of aqueous methylene-blue solution (1 : 1,000) and 1 c.c. of normal potash, diluted with about 2 c.c. of water, and boiled over a naked flame for a minute. In the presence of 0·5 per cent. of sugar, total decolorization takes place. If the coloration remains, the urine may be considered as not diabetic. Quantitative experiments showed that 1 mol. of methylene-blue is reduced by 1 mol. of dextrose. 1 c.c. of methylene-blue solution, 1 : 1,000 = 0·001 gram methylene-blue, would be reduced by 0·005 gram of dextrose. The decolorizing power of a normal urine, therefore, corresponds with that of a 0·11 per cent. solution of dextrose. If p is the percentage of sugar in the urine which has to be determined, v the dilution factor, c the number of c.c. of the methylene-blue solution required, then $p = 0{\cdot}05\ v\ c$.

The determination of sugar in urine is carried out in the following manner:—If sugar is found by the qualitative test, the urine is diluted according to its specific gravity.

Sp. gr. . .	1·017–1·025 (50 times).	1·025–1·030 (100 times).	1·030–1·038 (200 times).

The volume of the diluted urine which is required to exactly decolorize 0·001 gram of methylene-blue is then determined, several titrations being made. 1 c.c. of methylene-blue solution and 1 c.c. of normal potash are put into a test-tube, and the urine run in gradually from a burette, the liquid being boiled once or twice. This process is repeated until the exact amount of urine required has been found. The results obtained by the author fall between those given by the polarization method and by the reduction of Fehling's solution. Owing to the great dilution of the urine, the

disturbing influence of the other constituents of urine which are capable of reducing methylene-blue is scarcely perceptible.

Test for Glucose in Urine. B. Bizzari. (*Pharm. Post*, 1894, 35.) Small strips of a pure woollen fabric are impregnated with an aqueous 10 per cent. solution of stannous chloride and dried at a moderate temperature. A few drops of the urine to be tested are placed on such a strip and dried up at a gentle heat, when the presence of sugar will be indicated by the production of a dark stain, which varies in depth with the proportion of sugar present.

Estimation of Urobilin in Urine. A. Studensky. (*Chem. Centr.*, 1893, ii. 668.) 20 c.c. of urine are treated with one-tenth volume of saturated copper sulphate solution, then saturated with crystallized ammonium sulphate, and mixed with 10 c.c. of chloroform. The mixture is shaken for some minutes, and as soon as a copper-red layer of chloroform solution has settled, a portion of it is removed by a separating funnel, placed in a test-tube, and compared with a standard solution of urobilin in chloroform. This solution is prepared by extracting a considerable amount of urine which contains much urobilin in the manner described, evaporating the chloroform solution to dryness, washing with ether, and weighing the residue. A series of solutions is then made up from this residue, and these may be preserved even as long as two months if kept in the dark in closed vessels and covered by a layer of saturated solution of ammonium sulphate.

Detection of Chloroform in Urine after its Administration by Inhalation. P. Vitali. (*L'Orosi*, xvi. 299-304.) After chloroform has been administered by inhalation, very minute traces of it pass into the urine, and can be detected therein by the following delicate test:—A current of pure hydrogen is passed through the urine, and the chloroform vapour thus carried off is recognised by burning the hydrogen gas and allowing the flame to play on a piece of fine brass gauze. The wire thus assumes a bluish-white colour, and on dissolving the products of combustion from the gauze by ammonia a slight bluish coloration is obtained, and the solution is found to contain chlorine. Under any circumstances the amount of chloroform occurring in the urine under these conditions is exceedingly small, and in some cases none can be detected.

Detection of Mercury in Urine. S. Bondzyński. (*Zeitschr. für analyt. Chem.*, xxxii. 302, 303.) The author points out that the use of zinc powder in Ludwig's method involves a possible

source of error on account of the presence therein of cadmium, which may form a mirror closely resembling mercury in appearance. He therefore recommends that the presence of mercury thus detected should always be confirmed by means of iodine, or that the use of zinc should be abandoned, and copper, in the shape of foil or turnings, should be employed instead.

Detection of Piperazine in Urine. M. Biesenthal. (*Journ. Chem. Soc.*, March, 1894, 126, 127.) In the urine of patients taking piperazine the latter may be detected by means of picric acid, which forms a characteristic crystalline precipitate of piperazine picrate, which cannot be mistaken for the compound of picric acid with albumen. The precipitate may, however, be further identified by decomposing it with hydrochloric acid, removing the picric acid by agitation with ether, and detecting the piperazine by means of a solution of potassium bismuth iodide. In order to detect albumen along with piperazine in urine, acetic acid may be employed; this coagulates the albumen on heating, and the coagulum does not redissolve, whereas the precipitate of piperazine picrate disappears on heating and reappears on cooling.

Estimation of Uric Acid. I. Kreidl. (*Monatshefte*, xiv. 109–115.) To the solution of uric acid a moderate excess of normal solution of potassium hydrate is added, and then a considerable excess of N/30 iodine solution; after standing for three-quarters of an hour, the solution is acidified with hydrochloric acid. The excess of iodine then separates, and is titrated with N/30 thiosulphate, starch being used as an indicator; 3·5 atoms of iodine correspond with 1 mol. of uric acid under these circumstances. A solution of uric acid, and still more one of potassium urate, when allowed to remain in contact with air, gradually loses its power of reducing iodine solution, owing to the action of microbes.

Quantitative Separation of Uric Acid and Xanthine. C. Wulff. (*Zeitschr. für physiol. Chem.*, xvii. 634-643.) The author's method is based on the fact that hot dilute nitric acid breaks up uric acid into higher oxidation products, whilst xanthine is not affected. For particulars, reference should be made to the original paper.

Separation and Estimation of the Cacao Alkaloids. W. E. Kunze. (*Zeitschr. für analyt. Chem.*, xxxiii. 1 29. From *Journ. Chem. Soc.*) The processes hitherto employed have been directed exclusively to the estimation of the theobromine, whilst ignoring altogether the presence of caffeïne, and the wide divergences between their results may in part be attributed to the

fact that in some of the methods both alkaloids would be obtained, whilst in others the caffeïne would be more or less perfectly excluded. The following method, based on proof tests at each stage, estimates both alkaloids. 10 grams of the cacao are boiled for 20 minutes with about 150 c.c. of 5 per cent. sulphuric acid, and the soluble matters thoroughly washed out with boiling water. The warm extract is precipitated with a large excess of phosphomolybdic acid, and after 24 hours the precipitate is collected and washed with about a litre of 5 per cent. sulphuric acid. The filter containing the moist precipitate is treated in a beaker with excess of baryta in the cold, and carbonic anhydride is passed through the solution until all the baryta is thrown down. The whole is then thoroughly dried on the water-bath and extracted with boiling chloroform; the chloroform is distilled off, and the two alkaloids are left as a perfectly white residue, containing only a negligible trace of ash. The residue is weighed, dissolved in ammonia, and the solution heated to boiling. A considerable excess of silver nitrate (about 1·3 parts of silver for 1 part of theobromine) is added, and the boiling is continued until ammonia no longer escapes, and the liquid is reduced to a few cubic centimetres. Under these circumstances, an insoluble silver substitution-product of theobromine, $C_7 H_7 Ag N_4 O_2$, is obtained, whilst caffeïne forms no such derivative, and remains wholly in solution. The precipitate is collected and washed with boiling water. The silver in it may either be determined by ignition or by dissolving in nitric acid and precipitating as chloride (in the latter method the theobromine may be recovered from the filtrate for identification), but it is equally accurate and more rapid to employ a known excess of silver solution and to estimate the excess in the filtrate by titration with decinormal sulphocyanide solution (Volhard's method). Both the theobromine and caffeïne can then be recovered by neutralizing the respective nitric acid solutions, evaporating to dryness, and extracting with chloroform.

Separation of Theobromine and Caffeïne. H. Brunner and H. Leins. (*Journ. Chem. Soc.*, December, 1893, from *Schweiz. Wochenschr. für Pharm.*, xxxi. 85-87.) Süss extracts the raw material with light petroleum to remove caffeïne and fatty matter, and then with chloroform to dissolve the theobromine. The authors found, however, that the alkaloid obtained in this way is not pure, but reduces an ammoniacal solution of silver nitrate, whilst the pure substance yields a white compound of the formula $C_7 H_7 Ag N_4 O_2$.

When pure, theobromine may be separated from caffeïne by means of silver nitrate. About 0·2 or 0·5 gram of the mixed alkaloids is dissolved in 200 c.c. of water, mixed with 5 c.c. of ammonia, and boiled with 0·6 gram of silver nitrate until the ammonia is expelled. The liquid is cooled to 30°, the precipitate collected and washed with water at 30°, and then dried at 110°.

Rapid Estimation of Caffeïne in Coffee and Tea. M. Guillot. (*Chem. Centr.*, 1893, i. 865. From *Journ. Chem. Soc.*) 5 grams of finely powdered tea are boiled for 20 minutes with 100 c.c. of water, water being added occasionally during the boiling, to restore the loss caused by evaporation; 5 grams of lime are then added, and, after the boiling has been continued another 15 minutes, the mixture is filtered through a small wet cloth, and the insoluble matter again boiled with 50 c.c. of water, this operation being once more repeated. The united filtrates are now put into a 500 c.c. stoppered separatory funnel, and agitated three times in succession with 60 c.c. of chloroform. When clear, the chloroform is drawn off, filtered through cotton-wool, and evaporated in a tared dish.

The residual caffeïne is fairly pure. When applying the process to coffee, this must be coarsely ground, dried, and reduced to a fine powder. It is then boiled with water first for half an hour, then again twice for a quarter of an hour, and finally treated like the tea decoction.

Estimation of Caffeïne. A. Grandval and H. Lajoux. (*Journ. de Pharm. et de Chim.*, June, 1893, 545–549.) 5 grams of the finely powdered substance under examination are moistened with a mixture of 5 grams of ether and 1 gram of solution of ammonia, and treated in a continuous extraction apparatus with 50 c.c. of chloroform. The extraction is complete when a drop of the chloroform upon evaporation leaves no residue. The solution is distilled, the dried residue treated with 1 c.c. of one-tenth sulphuric acid, the acidulated residue then extracted with several small portions of boiling water and filtered, the filter being kept covered with a glass plate to prevent crystallization. The filtrate is rendered alkaline with ammonia, then evaporated to dryness on a water-bath, the dry residue treated with chloroform, the solution filtered, and the filter well washed with chloroform. On evaporating the chloroform solution very slowly and carefully, the caffeïne is obtained in a crystalline and sufficiently pure condition for weighing.

A Delicate Reaction of Eserine. J. E. Saul. (*Pharm. Journ.*, 3rd series, xxiv. 300.) An aqueous solution of a salt of the alkaloid is heated to boiling, and then some strong nitric acid added. The yellowish or orange solution thus obtained, when supersaturated with sodium hydrate, assumes a beautiful violet colour of remarkable intensity. On acidulating the solution the violet colour is discharged, to be restored on the addition of more alkali. The reaction is stated to be one of considerable delicacy.

A Delicate Test for Eserine. A. J. F. da Silva. (*Comptes Rendus*, cxvii. 330.) A very small fragment of the alkaloid or of one of its salts, when treated with one or two drops of fuming nitric acid in a porcelain dish, yields a yellow solution which, when heated on a water-bath, slowly changes to orange, and upon evaporation to dryness with constant stirring leaves a green residue. The latter, when brought in contact with a drop of nitric acid while being still kept on the water-bath, turns at first blue and subsequently yields a reddish-violet solution, slowly changing to a greenish yellow. On diluting this solution, it shows a marked fluorescence, appearing blood-red in reflected and greenish yellow in transmitted light.

Detection of Eserine. J. B. Nagelvoort. (*Pharm. Journ.*, from the author's revised American edition of Flückiger's *Reactions*.) An amorphous residue of a permanent blue colour is obtained if a trace of the alkaloid, or one of its salts, is evaporated in the presence of an excess of ammonia; this blue alkaloid dissolves in dilute acids with a red colour: sensitiveness 0·00001 gm. (1 : 100,000). The solution has a beautiful red fluorescence in reflected light; when evaporated, it leaves a residue that is green at first, changing to blue afterwards, the blue residue being soluble in water, alcohol, and chloroform, but not in ether. Chloroform extracts the blue colour from the watery ammoniacal solution only partially. The blue solutions are reddened at first by H_2S, and discoloured afterwards. The blue colour is restored by expelling the H_2S on the water-bath. A red fluid is obtained when 0·010 gm. of eserine or its salicylate, 0·050 gm. of slacked lime, and 1 c.c. of water are added together. Warmed in a water-bath, it turns green, and a piece of red litmus paper suspended in the test-tube colours blue; a glass rod moistened with HCl gives off the well-known white clouds characteristic of an ammonia reaction. The green solution does not lose its colour by evaporation. Baryta-water added to an eserine solution gives a white precipitate, that turns red when strongly agitated, sensitive to 0·00001 gm.

(1:100,000). Dissolve for this test 0·010 gm. of eserine salicylate in 100 c.c. of water (1:10,000). One c.c. of this, agitated with 5 c.c. of baryta-water, gives a bright pink-red coloured fluid. One c.c. of the 1:10,000 solution diluted to 10 c.c. will give a faint pink-red coloured fluid when shaken with 5 c.c. of baryta-water; 1 c.c. = 1:100,000. In substance the above description appeared in the original German text by Professor Flückiger (Berlin, 1892), but it has been somewhat elaborated and extended by the translator.

Estimation of Antipyrine. M. F. Schaak. (*Amer. Journ. Pharm.*, 1894, 321, 322.) When sodium nitrite is added to an acidified dilute solution of antipyrine, a blue-green colour is produced, which is still perceptible in dilutions of 1 in 20,000. In more concentrated solutions a crystalline precipitate of the same colour is formed. These results are due to the reaction between the liberated nitrous acid and the antipyrine, causing the formation of nitroso-antipyrine. A standard solution, which will not turn yellow or fade within 12 to 24 hours, can be made by dissolving ·02 gram of antipyrine in 25 c.c. of water, adding 1·6 c.c. of 1 per cent. sulphuric acid and ·8 c.c. of 1 per cent. solution of sodium nitrite, and then diluting to 100 c.c. When preparing a solution of an unknown amount for comparison with the standard, a few preliminary trials must be made to determine the amount of reagents required to fully develop the colour, avoiding such an excess as to produce a yellowish tinge in the time required.

To avoid precipitation, the solution should not be more concentrated than 1 in 500. When thus prepared it can be diluted until the colour corresponds exactly with that of the standard. The amount of antipyrine present is readily found by calculation. The reagents employed do not react similarly with other substances except with pyrazolone compounds.

The author points out that the ease with which antipyrine can be extracted from mixtures by means of chloroform widens the range of applicability of this method.

Estimation of Phenols in Crude Carbolic Acid. G. Schacherl. (*Chem. Centr.*, 1893, i. 324, 325.) 100 grams of crude carbolic acid, or 50 grams of the purer acid, are shaken in a separating funnel with 9 per cent. aqueous sodium hydrate (100 c.c.). The alkaline liquid is then run off, the oil once more extracted with 100 c.c., and finally two or three times with 50 c.c. of alkali. The combined alkaline extracts are mixed with an equal volume of water, and distilled until oily drops no longer pass over, indicating

the absence of hydrocarbons; the residue is then acidified with hydrochloric acid and again distilled, using a large condenser, when the phenols pass over as a heavy oil. The distillation is stopped when the distillate measures 200 c.c.; the oil is separated from the aqueous portion, and the latter returned to the distillation flask; the distillation is now again continued, and after a while interrupted, the oil being mixed with the first portion, and the aqueous layer returned to the distillation flask. The distillation is now repeated in this manner until the distillate no longer contains oily drops; the final aqueous distillate measures only 60-70 c.c., and is placed, together with the phenols, in a measuring cylinder. It is shaken with an excess of common salt, allowed to separate into layers, and the volume of the upper layer, consisting of phenols, read off. The resinous substances remain in the distillation flask.

Carbolic acid of a still better grade (amount not stated) is introduced directly into the distillation flask, together with sodium hydrate solution (300 c.c.), and treated as above described.

The mixture of phenols which has remained in contact with the sodium chloride solution contains 9 per cent. (by volume) of water. Since, however, phenols are soluble in concentrated brine, 5-6 per cent. too much cresol is found by direct reading. Red carbolic acid contains 11 per cent. of water, the technical product being, as a rule, saturated with water. By crude carbolic acid the author means a product containing at least 50 per cent. of cresols.

Detection of Chloral Alcoholate in Chloral Hydrate. E. Hirschsohn. (*Pharm. Zeitschr. für Russland*, 1893, 817.) One gram of the chloral hydrate to be tested, when covered with 1 c.c. of nitric acid of 1·38 specific gravity, should not, at an ordinary temperature or after warming, produce a yellow-coloured mixture or emit yellow vapours. If it does, the presence of alcoholate is proved.

A Distinguishing Test for Gallic and Tannic Acids. F. Davis. (*Pharm. Journ.*, 3rd series, xxiv. 1106.) Solutions of tannic acid are stated by the author to form with barium chloride a pink precipitate, gradually darkening. Solutions of gallic acid, when mixed with potash solution and then tested with barium chloride, produce a blue precipitate.

Estimation of Tannin. P. Sisley. (*Bull. de la Soc. Chim.* [3], ix. 755-772.) As the accuracy of the permanganate process for estimating tannin is seriously impaired by the presence of

organic impurities, the author suggests a modification in which the tannin is first precipitated as zinc tannate and the latter then oxidized with permanganate. In this manner he has obtained very satisfactory results. The ammoniacal zinc acetate used for the precipitation is made by dissolving zinc oxide (40 grams) in hot dilute acetic acid (65 c.c. glacial acid, 50 c.c. water) and adding excess of ammonia (22° B. to 500 c.c.), the filtered solution being kept in a well-stoppered vessel. The tannin solution (50 c.c. of about 3·3 per cent.) is treated with the zinc solution (5 c.c.), and the precipitated zinc compound rapidly filtered and washed with aqueous ammonia (3 per cent.), by which means the gallic acid and other impurities are eliminated. The temperature must not be raised, or gallic acid will be also precipitated. The portion of precipitate adhering to the sides of the precipitating vessel is dissolved in dilute sulphuric acid (50 c.c., 1 to 5), and the remainder washed with this solution into a large porcelain basin of 2 litres capacity, and diluted to 1 litre with water. Indigo-carmine solution (50 c.c. of a 20 gram per litre solution of 20 per cent. paste) is now added, and standard centinormal permanganate run in slowly (one to three drops per second) until the colour of the liquid changes from green to dirty yellow. The strength of the solution having been determined by a separate experiment, the amount of tannin present can be calculated, since the amount of permanganate required to oxidize 63 grams of crystallized oxalic acid is capable of oxidizing 41·57 grams of tannin.

Estimation of Moisture in Starch. O. F. C. Bloch. (*Comptes Rendus*, cxviii. 146-149.) The author finds that the proportion of moisture in starch cannot be accurately estimated by desiccation at 115° C., as even after maintaining that temperature for many hours the moisture is not wholly expelled. In order to effect perfect desiccation, a temperature of 155-160° C. is required, which can safely be applied without the risk of any other change affecting the accuracy of the estimation.

Mucilage of Starch for Iodometric Determinations. C. Meinecke. (*Chem. Zeitung*, from *Revue Universelle des Mines et de la Metallurgie*, xxv. No. 3.) The author states that wheat starch, rice starch, and grain starches generally give a violet or reddish-violet coloration with iodine, while the starches of potatoes, sago, tapioca, and arrowroot produce a pure blue colour, and are therefore preferable for iodometric titrations.

Estimation of Organic Matter in Potable Water by Means of Permanganate. P. E. Alessandri. (*L'Orosi*, xvi. 397–400. From *Journ. Chem. Soc.*) Kubel's process for the determination of organic matter in water consists in boiling the water for some time with dilute sulphuric acid and then titrating the boiling liquid with permanganate; the quantity of organic matter present is taken to be five times the weight of potassium permanganate which the water decolorizes.

The author proposes to use a standard solution of potassium permanganate containing 0·200 gram per litre for the titration; it is made up by dissolving the necessary quantity of permanganate in a litre of distilled water. 100 c.c. of the water is boiled for five minutes with 10 c.c. of dilute sulphuric acid, and the standard permanganate is added until the colour is no longer discharged. It is then boiled again for six to seven minutes, and if the colour disappears, more permanganate is added as before. The number of c.c. of this solution decolorized by a litre of the water gives directly the number of centigrams of organic matter per litre. A standard solution prepared by dissolving 0·400 gram of pure crystallized oxalic acid in a litre of water may be conveniently employed to determine the excess of permanganate added to the water.

Estimation of Nitrogen in Nitrates. T. F. Schmitt. (*Chem. Zeit.*, xvii. 173.) The method described by the author is a modification of his former process. 10 grams of the sample are dissolved in 500 c.c. of water. 10 c.c. of glacial acetic acid and 10 grams of a mixture of equal parts of iron and zinc powder are put into a 750 c.c. round-bottomed flask, and 25 c.c. of the nitrate solution added from a slow-running pipette. After ten minutes, when no more gas is evolved, 200 c.c. of water and 30 c.c. of aqueous soda (sp. gr. 1·25) are added; and the ammonia is distilled off as usual. For the estimation of the total nitrogen in nitrated manures, the author first reduces the substance with the acetic acid mixture, and then boils with excess of sulphuric acid in order also to convert the nitrogenous matter into ammonia.

A Source of Error in the Volumetric Estimation of Chlorides in Water Analysis. W. G. Young. (*Analyst*, xviii. 125–129.) When chlorides are estimated by Mohr's method in a sample of water without previous concentration, the results are too high, owing to the slight solubility of silver chromate; and the error thus introduced becomes greater still if the titration is conducted at an elevated temperature. The author therefore suggests that

previous to titration the water should be evaporated almost to dryness, and, in order to prevent over-dilution, the standard silver solution should not be too weak.

The Use of Sodium Peroxide in Chemical Analysis. J. Clark. (*Proc. Chem. Soc.*, No. 127.) Experiments are described showing that the sulphur and arsenic in minerals may be rendered soluble by cautiously heating the powdered substance with sodium peroxide, and that the peroxide may, in like manner, be used in estimating chromium in chrome ores and chromium alloys.

An ammoniacal solution of the peroxide may be used in separating manganese from zinc, nickel and cobalt, a single precipitation sufficing in the case of zinc.

Employment of Borax in Acidimetry. T. Salzer. (*Zeitschr. für analyt. Chem.*, xxxii. 529–537. See also *Year-Book of Pharmacy*, 1893, 109.) When borax is used for acidimetric titrations, weak solutions are preferable to strong ones, as the tendency of boric acid to redden litmus disappears on dilution. A decinormal solution (19·0872 grams per litre) is of convenient strength, and acids must be correspondingly diluted before titration. Methyl orange may serve as an indicator in the titration of mineral acids, but is much less sensitive than litmus in dilute solutions, and is not applicable in the case of organic acids. Litmus, on the other hand, is suitable for oxalic, acetic, tartaric, and citric, as well as for mineral acids. With phosphoric acid neutrality is reached when NaH_2PO_4 is formed. In the case of citric acid it is necessary to add the borax solution to the acid, as by reversing the conditions somewhat inaccurate results are obtained, owing probably to the formation of borocitric acid. In all other instances it does not appear to matter whether the borax be added to the acid or *vice versâ*.

Volumetric Estimation of Boric Acid. R. T. Thomson. (*Journ. Soc. Chem. Ind.*, xii. 432, 433.) The author finds that boric acid can be accurately titrated with standard solution of sodium hydrate by using phenolphthaleïn as indicator, but it is necessary to add to the liquid about one-third of its volume of glycerin. The amount of boric acid contained in borax may be estimated in the same manner, after first adding sufficient sulphuric acid to combine with the soda, methyl-orange serving as indicator in this instance.

Detection and Estimation of Oxalic Acid. A. Gunn. (*Pharm. Journ.*, 3rd series, xxiv. 408–410.) The author's method is based on the well-known yellow colour of ferrous oxalate. The reagent

recommended by him is a pure unoxidized solution of ferrous phosphate in an excess of phosphoric acid, which serves both for the detection of small quantities of oxalic acid, and also for their quantitative estimation by means of a colorimetric process, of which full details are given. The process is also available for the detection and estimation of oxalic acid in tartaric acid liquors; but if these liquors contain much alumina, the qualitative test only is available.

Influence of Nitric Acid and Nitro-Hydrochloric Acid on Sulphuric Acid Estimations. P. E. Browning. (*Amer. Journ. Sci.*, lxv. 399–404.) The results of a series of carefully conducted gravimetric estimations of sulphuric acid as barium sulphate have led the author to the conclusion that the presence of an excess of nitric acid, or nitro-hydrochloric acid, amounting to 10 per cent. of the volume of the liquid, is not only no disadvantage, but is, on the contrary, beneficial, inasmuch as under these conditions the precipitation is complete, and the barium sulphate is thrown down in a state of greater purity. In order to prove that the correctness of the results was not due to accidental counterbalancing between any loss caused by the solvent action of the acids, and any increase due to the co-precipitation of alkali salts, the author took the precaution of recrystallizing the barium sulphate from hot concentrated sulphuric acid, and then again washing it with water.

Volumetric Estimation of Phosphoric Acid. H. Pemberton. (*Journ. Amer. Chem. Soc.*, xv. 382–395; *Journ. Chem. Soc.*, June, 1894.) The author proposes a method based on the titration of the molybdic precipitate. 1 gram of the phosphate is dissolved in nitric acid and diluted with water to 250 c.c.; 25 c.c. is neutralized with ammonia, and then mixed with 5 c.c. of nitric acid (sp. gr. 1·4); 10 c.c. of a saturated solution of ammonium nitrate and 20 c.c. of water is next added, and the whole heated to boiling. An aqueous solution of ammonium molybdate (90 grams per litre) is now added in portions of 5 c.c. as long as a precipitate is produced. This is washed by decantation, a filter being also used, and then dissolved in a known volume of standard alkali. After adding phenolphthaleïn, the excess of alkali is titrated back with standard acid.

If 1 c.c. of the alkali is to correspond with 0·001 gram of phosphoric anhydride, its strength should be 0·3265—normal.

Volumetric Estimation of Phosphoric Acid. A. F. Holleman. (*Zeitschr. für analyt. Chem.*, xxxiii. 185, 186.) The acid solution of alkali phosphates is titrated with standard alkali in the presence

of phenolphthaleïn, and when neutrality has been reached (indicating that the phosphate now corresponds to the formula $\dot{M}_2HPO_4$), a known quantity of silver nitrate is added in the presence of sodium acetate, and the excess of silver titrated by Volhard's method.

Estimation of Phosphoric Acid as Magnesium Pyrophosphate. H. Neubauer. (*Zeit. für anorg. Chem.*, iv. 251-266. From *Journ. Chem. Soc.*) Ammonium magnesium phosphate varies in composition with the conditions under which it is precipitated, and three cases may be recognised:—(1) When the precipitate is formed in a neutral or ammoniacal solution, which does not contain an excess of magnesium salt. In this case the ammonium salts present so affect the precipitate that it contains less magnesia than is required for the normal salt; this entails a loss of phosphoric acid when the precipitate is ignited. (2) When the precipitate is thrown down by the addition of an excess of magnesium salt, no excess of ammonia being present. In this case, normal ammonium magnesium phosphate is produced, and the analytical results are correct. (3) When the precipitate is thrown down by an excess of magnesium salt in the presence of an excess of ammonia. In this case the precipitate contains more magnesia than is required for the normal salt, and the analytical results are too high.

The author recommends the following method:—The separation of the ammonium phosphomolybdate is effected as usual, care being taken that precipitation of free molybdic acid is avoided. The precipitate is dissolved in 100 c.c. of cold $2\frac{1}{2}$ per cent. ammonia solution, and the phosphoric acid precipitated by dropping in, with constant stirring, as many c.c. of magnesia mixture (55 grams of crystallized magnesium chloride and 70 grams of ammonium chloride dissolved in 1 litre of $2\frac{1}{2}$ per cent. ammonia solution) as there are centigrams of phosphoric anhydride present. At least one minute should be occupied in adding 10 c.c. of the magnesia mixture. After the precipitation, the liquid is vigorously stirred, and left for at least three hours, when the precipitate is collected and washed with $2\frac{1}{2}$ per cent. ammonia water, until the chlorine reaction has disappeared. The dried filter is transferred, with the precipitate, to a platinum crucible, and burnt, the temperature being gradually raised to a medium red heat until the precipitate is quite white. Ignition over the blowpipe until the weight is constant is necessary. To the weight of the magnesium pyrophosphate must be added a correction for the

loss on ignition; a table is given which shows the milligrams to be added to quantities of pyrophosphate, from 0·01 to 0·35 gram; in the last case, the correction amounts to 11 milligrams.

Estimation of Boric Acid. A. K. Reischle. (*Zeit. für anorg. Chem.*, iv. 111–116.) The substance under examination is slowly warmed in a platinum crucible with six times its weight of resublimed ammonium fluoride, when ammonium borofluoride volatilizes. After cooling, the residue is treated with strong sulphuric acid, evaporated to dryness, and ignited. From the difference in weight of the sulphate found and borate taken, the amount of boric acid originally present may be calculated. The results are accurate; with borax they varied from 99·6 to 99·9 (in one case 99·3) per cent. of the theoretical; in the case of a mixture of freshly ignited lime with boric acid, from 100·3 to 100·5 (in one case 98·5) per cent.

Detection of Phosphorus in Poisoning Cases. H. W. Bettink and F. C. E. v. Embden. (*Chem. Centr.*, 1893, 1104.) The authors found that in a case of poisoning by phosphorus, the latter could not be detected in the body by the usual process eight days after death. Traces of hypophosphorous acid and of phosphoretted hydrogen could, however, be detected in every distillate; but these afforded no satisfactory evidence of poisoning with phosphorus, as the deceased had been medically treated with hypophosphites. A search was therefore made for arsenic, which, though an almost constant impurity in commercial phosphorus, hardly ever occurs in hypophosphites. Its presence was demonstrated in the liver.

Detection of Hydrocyanic Acid in Presence of Ferrocyanides. W. Autenreith. (*Archiv der Pharm.*, ccxxxi. 99–109.) Hydrocyanic acid or simple cyanides may be readily detected in the presence of potassium ferrocyanide by distilling with a large excess of sodium bicarbonate, and testing the distillate for hydrocyanic acid. In the presence of mercuric cyanide it is necessary to add a small quantity of sulphuretted hydrogen solution in addition to the bicarbonate, as the latter alone is incapable of decomposing the mercuric salt.

Estimation of Hydrocyanic Acid in Cherry-Laurel Water. G. Dénigès. (*Journ. de Pharm.* [5], xxix. 10–15.) The author is of opinion that in the titration of hydrocyanic acid with silver nitrate by Liebig's method, the end of the reaction is often not sufficiently distinct, and that the first appearance of a permanent precipitate is retarded by the presence of the slightest excess of alkali. He therefore suggests the use of potassium iodide as an

indicator, in solutions rendered strongly alkaline with soda or ammonia, and states that, in this manner, the end-point is quickly and sharply determined.

Estimation of Hydrocyanic Acid. G. Gregor. (*Zeitschr. für analyt. Chem.*, xxxiii. 30–45.) The author considers that the volumetric methods for the estimation of hydrocyanic acid, introduced by Liebig, Vielhaber, and Mohr, give higher numbers and are therefore less exact than the gravimetric process. Volhard's method, carried out as follows, is stated by him to give results closely agreeing with those obtained by weighing. 100 c.c. of the solution are mixed in a ¼-litre flask with 5 c.c. of ammonia, 50 c.c. of decinormal silver nitrate are added, and then immediately nitric acid, free from nitrous acid, to slight acidity. After making up and shaking, 50 c.c. of the filtrate, mixed with a few drops of ferric sulphate, and, if necessary, with more nitric acid, are titrated with decinormal sulphocyanide.

With regard to the gravimetric estimation of hydrocyanic acid, the author alludes to the necessity of conducting the operation so as to guard against any loss of the acid by volatilization, and also to the well-known fact that, in the case of cherry-laurel water and similar preparations, the silver nitrate must be preceded by ammonia and followed by dilute nitric acid in order to ensure complete precipitation of the whole of the cyanogen as silver cyanide.

Estimation of Sulphocyanic, Hydrocyanic, and Hydrochloric Acids. P. L. Jumeau. (*Bull. de la Soc. Chim.* [3], ix. 346–351.) Sulphocyanides can be titrated with accuracy in the presence of hydrochloric or sulphuric acid by a solution of potassium permanganate, standardized by a solution of ammonium sulphocyanide, itself valued by titration with silver nitrate in the usual manner. All the sulphur is converted into sulphuric acid, hydrocyanic acid being liberated; the permanency of the permanganate in the solution marks the end of the titration. If sulphates are to be determined in the liquid, they may be precipitated by barium chloride, after the titration, and the amount of barium sulphate corresponding with the sulphocyanide deducted from the weight of the precipitate. If hydrochloric or hydrocyanic acid has to be estimated in a liquid as well as sulphocyanic acid, one part of the solution may be precipitated with silver nitrate and the precipitate weighed, whilst the sulphocyanic acid is determined in another portion by the method indicated. Or the silver precipitate may be dissolved in hot ammonia, the silver precipitated by hydrochloric

acid, and the sulphocyanic acid determined by titration in the filtrate. Should sulphocyanic, hydrocyanic, and hydrochloric acids have to be all estimated in the same solution, the silver precipitate from one portion of it is treated as described above, in order to estimate the sulphocyanic acid. The silver precipitate from another portion is treated by the Kjeldahl process, Nordhausen sulphuric acid and metallic mercury being used in place of the ordinary strong sulphuric acid and mercuric oxide; by this means the nitrogen of the cyanide and sulphocyanide is estimated as ammonia; as the sulphocyanide has been already estimated, the cyanide may be calculated; the weight of the chloride in the silver precipitate is determined by difference. The hydrochloric acid may also be estimated directly by oxidizing the sulphocyanic acid in the original solution by potassium permanganate, in the presence of sulphuric acid, expelling the hydrocyanic acid by ebullition, preferably in the presence of zinc, and precipitating the hydrochloric acid with silver nitrate.

A Quantitative Method of Separating Iodine from Chlorine and Bromine. D. S. Macnair. (*Proc. Chem. Soc.*, No. 127.) This method is based on the fact that when treated with potassium bichromate and concentrated sulphuric acid, silver iodide is completely converted into silver iodate, whereas silver chloride and bromide are converted into sulphate. Two portions of a solution containing the three halogens are precipitated with silver nitrate: the one precipitate is weighed, the other is heated with the oxidizing mixture and the resulting iodate is then reduced by means of sulphurous acid and the iodide is filtered off and weighed. The silver originally present as chloride and bromide contained in the filtrate from the iodide is precipitated and weighed as chloride. The method affords very accurate results.

Estimation of Iodine in Presence of Bromine and Chlorine. M. Gröger. (*Zeitschr. angew. Chem.*, 1894, 52-54.) The author's process is based on the conversion of alkaline iodides into iodates by potassium permanganate, which has no action on bromides or chlorides. The solution, which should contain no ammonia, is heated on a boiling water-bath, and a 4 per cent. solution of potassium permanganate is added until the supernatant liquid turns decidedly red. The excess of permanganate is then reduced by adding a few drops of alcohol. The liquid is filtered and the precipitate thoroughly washed by decantation. The filtrate, after cooling, is mixed with 0·5 gram of potassium iodide, acidified with hydrochloric acid, and the liberated iodine is then titrated

with sodium hyposulphite. One-sixth part of the iodine found was originally present in the sample.

Detection of Traces of Chlorides in the Presence of Iodides and Bromides. A. Villiers and M. Fayolle. (*Comptes Rendus*, cxviii. 1152 and 1204.) The authors' process is based upon the production of coloured oxidation products by the action, upon an acid solution of aniline, of chlorine liberated by means of potassium permanganate and sulphuric acid. Iodine and bromine which are likewise liberated by this process form only colourless or white compounds, while chlorine gives rise to coloured oxidation products, which are black if present in quantity, but otherwise violet or blue when warm, changing to red on cooling. It is stated that traces of chloride can thus be detected in the presence of iodides and bromides.

The delicacy of the reagent depends on the acidity of the liquid, a solution not acid giving no reaction, while a large quantity of mineral acid also interferes with the test. The authors find acetic acid preferable, and prepare the reagent as follows :—

Saturated aqueous solution of colourless aniline	400 c.c.
Glacial acetic acid	100 „

This reagent can be kept indefinitely in yellow bottles without becoming coloured.

By means of this reagent small quantities of chlorine can be forthwith detected in bromine water made from commercial bromine.

Detection of Bromides in the Presence of Iodides. A. Villiers and M. Fayolle. (*Comptes Rendus*, cxviii. 1265.) The solution under examination, which must be free from nitric acid, is mixed with an excess of ferric chloride solution containing no free chlorine. The iodine thus liberated is volatilized by evaporating the mixture to dryness and heating the residue on a water-bath for several hours. The residue is dissolved in water, the iron precipitated by sodium hydrate, the filtrate acidified with hydrochloric acid, and the bromine liberated by the cautious addition of weak chlorine water in the presence of carbon bisulphide and recognised by the yellow colour assumed by the latter.

Detection of Chlorides, Bromides, and Iodides. J. Torrey. (*Journ. Anal. and Appl. Chem.*, vi. 667–669. From *Journ. Chem. Soc.*) The author has slightly modified the process originated by Hart and communicated by Kebler. The bulb tube arrangement

has been replaced by a small tube having only one small bulb blown on it, the tube being bent slightly away from the perpendicular about half an inch above where it leaves the cork. Above the bulb there should be about half an inch of tube left. The flask containing the mixture is charged with ferric sulphate as usual, and the iodine evolved is readily detected by holding in the steam a small piece of starch-paper. When iodine fumes can no longer be detected, a crystal of potassium permanganate is added, and, on further heating, bromine is given off, which is best detected by allowing the fumes to act on iodized starch-paper. The boiling must be quite brisk, or else the bromine will not be completely expelled. The residue is then tested for chlorine in the usual manner. The author advises working on a very small quantity of substance.

Estimation of Calcium Hypochlorite, Chloride, and Chlorate in Bleaching Powder. M. Rosenbaum. (*Zeitschr. für angew. Chem.*, 1893, 80.) The hypochlorite is estimated by Pennot's process by means of arsenious acid and iodine solution. For the determination of the chloride a measured portion of the original solution is boiled to destroy the hypochlorite, and is then titrated with silver nitrate, using potassium chromate as indicator. Allowance must be made for the chloride formed by the decomposition of the hypochlorite. The chlorate is estimated by boiling a measured portion of the solution for some time, then cooled and mixed with a definite quantity of ferrous ammonium sulphate and an excess of sulphuric acid. After boiling the mixture and again allowing to cool, the excess of iron is titrated back with permanganate. From the amount of chlorate found by calculation a deduction must be made for that formed from the hypochlorite.

Separation of Barium, Strontium, and Calcium. R. Fresenius. (*Zeitschr. für analyt. Chem.*, xxxii. 312-317.) The following qualitative method permits the detection of small amounts of any one of the alkaline earths in presence of large quantities of the others. The carbonates are converted into nitrates and thoroughly dried at 180°, and, as soon as cold, triturated with equal volumes of absolute alcohol and ether, any residue being washed with the same mixture. Traces of strontium may pass into solution with the calcium, whilst traces of calcium may remain in the residue. To the solution, 2 drops of dilute sulphuric acid are added. Any considerable precipitate is undoubtedly calcium sulphate. A trifling precipitate may be due to strontium. In this case, 4 c.c. of water are added, and the ether-alcohol is evaporated off. A few

drops of ammonia are added, with 1 gram of ammonium sulphate, and the liquid is boiled and filtered, acidified with acetic acid, and tested for calcium by ammonium oxalate. The nitrates insoluble in ether-alcohol are dissolved in 100 c.c. of water, acidified with 3 or 4 drops of acetic acid, heated to boiling, and treated gradually with potassium chromate until the solution is yellow and no longer gives an odour of acetic acid on boiling. After an hour, the barium chromate is filtered off, and a portion of the filtrate tested with ammonia and ammonium carbonate. If a bulky precipitate is produced, it must be strontium carbonate. If otherwise, the rest of the filtrate, mixed with a drop of nitric acid, is concentrated and precipitated with ammonium carbonate, any trifling precipitate is washed, converted into chloride, dried, dissolved in a mixture of 3 vols. of water and 1 vol. of alcohol, and boiled after adding one drop of potassium chromate. Strontium is indicated by a pulverulent, yellow precipitate.

For quantitative purposes, either the calcium may first be separated by treating the nitrates with ether-alcohol, and then the barium be separated from the strontium by potassium chromate, or the barium may first be separated as chromate, the calcium and strontium be precipitated as carbonates, converted into nitrates, and separated by ether-alcohol. Both methods give equally accurate results; the barium and calcium precipitates are pure, the strontium alone retaining a trace of calcium.

Estimation of Ammonia in Presence of Sulphides or Cyanides. E. Henry. (*Bull. Soc. Chim.* [3], ix. 1018.) If ammonia is to be estimated in the presence of sulphides or cyanides, the two latter should be precipitated with basic acetate of lead before the distillation with alkali, as otherwise appreciable quantities of sulphuretted hydrogen or hydrocyanic acid are liable to pass over with the distillate.

The Sulphocyanide Test for Iron. H. Schulze. (*Chem. Zeitung*, xvii. 2.) Very weak solutions of ferric salts not containing any free mineral acid have been observed by the author to undergo a change on being kept for some length of time, and to fail to react with potassium sulphocyanide in the usual manner. A similar alteration is stated to occur with stronger solutions on boiling. The probable conversion of the iron into Graham's soluble ferric hydrate under these conditions is suggested as an explanation of the failure of sulphocyanide to produce the characteristic red coloration.

Estimation of Iron in Waters. A. Zega. (*Chem. Zeitung*,

xvii. 1564, 1565.) The process suggested by the author is a colorimetric one, based on the well-known reaction between ferric solutions and potassium sulphocyanide. Details are given in the paper.

Separation and Estimation of Copper and Cadmium. P. E. Browning. (*Amer. Journ. Sc.* [3], xlvi. 280–283.) The method recommended by the author is a modification of the iodide process, and is stated to give very satisfactory results. The solution containing the two metals is mixed with a sufficient quantity of potassium iodide to ensure complete precipitation of the copper, and the mixture is completely freed from the liberated iodine by boiling. The precipitated cuprous iodide is collected on a weighed asbestos filter, washed, dried at 120–150°, and weighed. The filtrate is heated with potassium nitrite and sulphuric acid in order to decompose the excess of iodide, and when every trace of iodine is expelled, the cadmium is precipitated by boiling with sodium carbonate. The cadmium carbonate is next collected on an asbestos filter, and converted into oxide by ignition.

Volumetric Estimation of Mercury. M. J. Laborde. (*Journ. de Pharm. et de Chim.*, 1893, 507.) The process described by the author is based on the following reaction :—

$$2\,HgCl_2 + SnCl_2 = SnCl_4 + 2\,HgCl.$$

The stannous chloride solution is prepared by dissolving 4 grams of metallic tin in 50 c.c. of hot hydrochloric acid and adding sufficient water to make up 1 litre. It is titrated with 10 c.c. of a solution of mercuric chloride (10 grams per litre) in the presence of 5 c.c. of a solution containing 100 grams of ammonium acetate and the same quantity of acetic acid.

Detection of Tin in Presence of Iron, Copper, and other Metals. G. Dénigès. (*Bull. de la Soc. de Pharm. de Bordeaux*, September, 1893.) The reagent employed by the author is a solution of 10 grams of ammonium molybdate in 100 c.c. of water and 100 c.c. of pure sulphuric acid. Several drops of the solution under examination are placed on a platinum dish with one drop of sulphuric acid, and a piece of zinc is placed on the platinum in contact with the liquid; after one or two minutes the zinc is removed, the dish washed under a thin stream of water, allowed to drain, and if a metallic stain is found on the platinum, at the place of contact with the zinc, it is moistened with 4 or 5 drops of hydrochloric acid, and evaporated to complete dryness. The residue is treated with a few drops of water, and one or two drops of the resulting solution added to two or three c.c. of the molybdate solution, when

the presence of tin will be indicated by an immediate blue coloration.

Estimation of Lead in Ores. A. H. Low. (*Chemical News*, lxvii. 178, 179.) 1 gram of ore is heated carefully with 10 c.c. of a mixture of equal parts of nitric acid and water until pretty well decomposed; the nitric acid is then expelled by boiling with 10 c.c. of concentrated sulphuric acid, and, when cool, 10 c.c. of pure dilute sulphuric acid (1 : 9) and about 2 grams of Rochelle salt are added. When the latter is dissolved, 40 c.c. of distilled water is added, the whole boiled, the precipitate collected, washed with dilute sulphuric acid, and then heated with a saturated solution of ammonium chloride until all the lead sulphate is dissolved; the liquid is then filtered. Strips of pure aluminium are placed in the filtrate, which is boiled until the lead is all precipitated, cold water is added, the lead adhering to the aluminium removed, all the lead collected in a porcelain dish, washed with water, and finally with alcohol, then dried and weighed. A deduction of 3 per cent. is a fair allowance for arriving at the fire assay of a pure ore of the same grade.

Estimation of Lead in Tartaric and Citric Acids. R. Warington. (*Journ. Soc. Chem. Ind.*, xii. 97–104, 222–225.) The author considers it almost impossible for manufacturers to produce commercial tartaric and citric acids absolutely free from lead, but thinks that the proportion of this metal should not exceed 5 parts per million. He recommends the following process for its estimation:—40 grams of the sample of acid are dissolved in a little water, and pure strong ammonia is added in slight excess; the liquid is then cooled and diluted to 120 c.c. As a preliminary experiment, 10 c.c. are diluted to 50 c.c., and mixed in a Nessler cylinder with 1 drop of solution of ammonium sulphide; the colour developed indicates what volume of solution should be taken for the determination, and this may range from 5 to 50 c.c. The tint has now to be matched with the pure solutions. A volume of *pure* ammoniacal tartrate or citrate solution identical with that taken of the acid under examination is mixed with a measured quantity of a slightly acid lead nitrate solution, containing 0·1 gram of metallic lead per litre. A drop of ammonium sulphide is then added, and, should the coloration be too light or too dark, the experiment must be repeated until a perfect match is obtained, just as in Nesslerizing water. Iron and copper, if present, can be rendered harmless by the addition of a drop of solution of potassium cyanide before adding the ammonium sulphide.

Mere traces of iron may be ignored, as they do not interfere with the test.

Volumetric Estimation of Arsenic and Antimony. S. Györy. (*Zeitschr. für analyt. Chem.*, xxxii. 415–421.) The process suggested by the author is based on the complete conversion of arsenious and antimonious oxides into the corresponding pentoxides by the action of potassium bromate, in accordance with the following equation :—

$$2\,K\,Br\,O_3 + 2\,H\,Cl + 3\,As_2\,O_3 = 2\,K\,Cl + 2\,H\,Br + 3\,As_2\,O_5.$$

A decinormal bromate solution is obtained by drying the salt at 110° and dissolving 2·7850 grams to 1 litre. The arsenious or antimonious solution is strongly acidified with hydrochloric acid, then mixed with one drop of a 1 per cent. solution of methyl-orange, and the bromate solution added from a burette until the liquid changes from pink to colourless. This change is brought about by the final drop of the bromate with great precision.

The Test for the Presence of Arsenic in Bismuth and Antimony Salts in the Recent Edition of the United States Pharmacopœia. J. C. Umney. (*Pharm. Journ.*, 3rd series, xxiv. 439.) The author objects to the modification of Bettendorf's test for the detection of arsenic adopted in the above-named instances in the United States Pharmacopœia. The original test is a most useful one, and, as usually applied, consists in the addition of a solution of stannous chloride in hydrochloric acid, but it is now modified in the above work by the presence of metallic tin, which, in the case of the salts of bismuth and antimony, appears to be inadmissible. Under the head of bismuth subcarbonate the U.S.P. states as follows:—"If 1 gram of the salt be ignited in a porcelain crucible, the residue when cold dissolved in 5 c.c. of stannous chloride T. S. (see list of reagents, Bettendorf's test for arsenic), and a small piece of pure tin foil added, no dark coloration or precipitate should be produced within fifteen minutes (limit of arsenic)." If this test be carried out with samples of the salts of bismuth and antimony—the salts and reagents having been previously proved to be free from arsenic—the following reaction takes place:—(1) Bismuth salts: The solution darkens immediately on the addition of metallic tin, and a heavy black precipitate rapidly forms. At the end of the prescribed time, if the mixture be well agitated, almost complete precipitation of the bismuth has taken place, so that if the liquid separated by filtration be poured into water, hardly any precipitation of oxysalt occurs. The black precipitate is found to consist wholly of bismuth. (2) Antimony salts: Under the same condi-

tions, the precipitation is not so rapid as in the case of bismuth salts, nor so complete, but a black precipitate is formed, quite masking any indication of arsenic if present. If Bettendorf's reagent be applied, without metallic tin, to a solution of the chlorides of either metal in hydrochloric acid, the minutest quantity of arsenic may be detected.

Volumetric Estimation of Silver. G. Dénigès. (*Comptes Rendus*, cxvii. 1078–1081.) The reaction between silver nitrate and potassium cyanide, with formation of silver potassium cyanide, proceeds regularly in presence of ammonia, and the end reaction is made very sensitive by adding a small quantity of potassium iodide to the liquid. The result is not affected by considerable variations in the proportion of ammonia, or by the presence of alkaline hydrates, carbonates, chlorides, bromides, phosphates, etc. It is therefore not only a very accurate process for the estimation of hydrocyanic acid or cyanides, but, by using a standard solution of potassium cyanide, it can be employed for the estimation of any silver compound whatever.

A solution of about 10 grams of potassium cyanide per litre is used, and will remain unchanged for many days, its stability, especially in hot solutions, being increased by the presence of excess of alkali.

The quantity of substance taken for analysis should contain about one-thousandth of a gram equivalent of silver, and is dissolved in 10 c.c. of ammonia solution and 5 c.c. of water, with the aid of heat if necessary. The ferrocyanide, bromide, and iodide will not dissolve until the standard cyanide solution is added. The phosphate, arsenate, chromate, oxide, and sulphide should be dissolved in nitric acid and then mixed with excess of ammonia. In all cases the liquid containing a slight excess of ammonia is mixed with 20 c.c. of standard cyanide solution, about 100 c.c. of water, and a small quantity of potassium iodide solution, and decinormal silver nitrate solution is added gradually with constant agitation until a slight, permanent turbidity is produced. The difference between the volume of silver solution required and that required for the 20 c.c. of standard cyanide solution alone, gives the quantity of silver present in the substance.

This process is available for the volumetric estimation of precipitates of silver chloride; the direct estimation of chlorides in liquids of animal origin; the determination of the xantho-uric compounds in urine by precipitation with ammoniacal silver nitrate solution, and estimation of the excess of silver in the

filtered liquid; estimation of potassium iodide by precipitation with ammoniacal silver nitrate solution; and the estimation of all substances such as acetylenes, arsenic hydride, antimony hydride, aldehydes, carbonic oxide, etc., which are capable of altering the strength of alcoholic, ammoniacal, or acid solutions of silver salts.

Detection of "Saccharin" in Presence of Salicylic Acid. E. Hairs. (*Apoth. Zeitung*, viii. 500.) The isolated product containing the saccharin and salicylic acid extracted from the substance under examination is acidified with hydrochloric acid and then mixed with excess of bromine water, which causes the complete precipitation of the salicylic acid. The filtrate from the dibromosalicylic acid is freed from bromine by a current of air and then agitated with ether. The latter, on evaporation with a few drops of sodium bicarbonate, leaves a residue of "saccharin," which may be recognised by its sweet taste and other well-known reactions.

Detection of Saccharin in Beer. F. Gantter. (*Zeitschr. für analyt. Chem.*, xxxii. 309–312.) Half a litre of beer is evaporated to a syrup, and, after the addition of a few drops of hydrochloric acid, is shaken in a stoppered bottle with 200 c.c. of 95 per cent. alcohol. The clear solution decanted from the precipitate is evaporated and the residue shaken with ether. The ethereal extract is evaporated and the residue boiled with water. The aqueous solution when evaporated leaves the saccharin in a sufficiently pure condition to allow of its recognition by its intensely sweet, characteristic taste, this taste never being observed in the residue from pure beer.

Detection of Saccharin in Wine and Beer. E. Spaeth. (*Zeitschr. für angew. Chem.*, 1893, 579–581.) The sample of beer is first freed from the bitter principles of hop by adding a few crystals of copper nitrate; wine does not require this preliminary treatment. About 200 c.c. of the sample are mixed with sand and evaporated; the residue is mixed with 2 c.c. of phosphoric acid, and repeatedly extracted at a slightly elevated temperature with a mixture of equal parts of ether and petroleum ether. The resulting solutions are filtered through asbestos and distilled; the residue is treated with a little water containing a very small quantity of sodium carbonate, and then tested. A sweet taste indicates the presence of saccharin, the quantity of which is estimated as usual by fusion with nitre and determination of the resulting sulphate.

Estimation of Succinic Acid in Wine. A. Rau. (*Zeitschr. für analyt. Chem.*, xxxii. 482–486.) 100 c.c. of the wine are evaporated to a syrup, extracted repeatedly with boiling alcohol, and the

cooled alcoholic solutions filtered, mixed, and distilled. The residue is dissolved in a little hot water, and the cooled solution filtered, if turbid; it is then treated with barium nitrate, 3–4 vols. of 90 per cent. alcohol are added, and the mixture is well stirred. The precipitate, containing tartaric, malic, and succinic acids, is collected, washed well with 70 per cent. alcohol, warmed with sodium carbonate solution, and filtered; the filtrate is neutralized with nitric acid, evaporated to a small bulk, and, after neutralization with ammonia, is precipitated with a magnesia mixture, made with magnesium nitrate, ammonium nitrate, and ammonia. The precipitate, which contains the tartaric acid, is filtered off after three or four hours' repose; the filtrate is heated with potash until all the ammonia is expelled, then filtered from magnesia, neutralized exactly with nitric acid, diluted to 100–150 c.c., and precipitated with silver nitrate (1:20). Silver nitrate precipitates succinic acid completely, but produces precipitates in malic acid solutions only when they are stronger than 1:800. The precipitate is collected on a tared filter, washed well, dried, and weighed. As a control, it may be ignited and the silver weighed. Should the solution, to which silver nitrate is to be added, contain chlorides, which may happen if too much alcohol has been added after the barium nitrate, or too long an interval has been allowed before filtration, a portion of it must be evaporated, incinerated, the chlorine determined, and a corresponding quantity of silver chloride subtracted from the weight of the silver succinate.

Detection of Mineral Acids in Vinegar. G. Griggi. (*Chem. Centr.*, 1893, 1033.) The reagent recommended by the author is a solution of magenta in alcohol of 90 per cent. On adding one drop of this solution to 1 c.c. of the vinegar in a porcelain dish, the colour remains unchanged if the vinegar was pure; while in presence of 1 per cent. of mineral acid in the vinegar, the reddish-violet colour is changed to a dirty yellow.

Detection of Margarin in Butter. F. Gantter. (*Zeitschr. für analyt. Chem.*, xxxii. 411–413.) The iodine number for genuine butter varies from 13 to 16 when determined by the author's process; that of margarin is variable according to the kind of fat or oil employed in its manufacture, but is always much higher, so that an iodine absorption exceeding 16 per cent. would indicate adulteration. Genuine butter gives only a straw-yellow to reddish-yellow colour with strong sulphuric acid; most of the oils used in making margarin give a dark-brown colour.

Detection and Approximate Estimation of Cotton-Seed Oil in

Lard and Olive Oil. F. Gantter. (*Zeitschr. für analyt. Chem.*, xxxii. 303–308. From *Journ. Chem. Soc.*) The author has obtained specimens of cotton oil, as well as of adulterated lard, which give no reaction with Becchi's silver nitrate test; this test can therefore no longer be depended on for the detection of this adulterant. The iodine absorptions of lard and cotton oil, 23–27 per cent. and 43–45 per cent. respectively, as determined by the author's process, differ widely enough to allow of the calculation, within 10 per cent., of the proportion of cotton oil present. To detect smaller amounts than 10 per cent., 1 c.c. of the perfectly dry, melted fat or oil is dissolved in 10 c.c. of light petroleum in a test-tube, a single drop of concentrated sulphuric acid is added, and the whole well shaken. Pure lard gives only a straw-yellow to feeble reddish-yellow coloured liquid, from which, on repose, dark reddish-yellow drops slowly settle out, leaving a nearly or perfectly colourless upper liquor. Olive oil acquires a rather darker colour at first, but behaves like lard on standing. In presence of cotton oil, a deep brown to black colour is immediately produced, and remains unchanged even on standing for a long time. As little as 1 per cent. can thus be detected.

Detection of Sesame Oil as an Adulterant in Olive Oil. P. Soltsien. (*Pharm. Zeitung*, 1893, 654.) On shaking five volumes of pure olive oil with one volume of Bettendorf's reagent and heating on a water-bath for a few minutes, an orange-yellow coloration is imparted to the reagent. Sesame oil treated in the same way gives a deep wine-red coloration. In mixtures of the two oils the red colour caused by the sesame oil will be distinctly discernible.

Estimation of Beef Fat in Lard. W. F. K. Stock. (*Analyst*, xix. 2–7.) The author's process is based on the slight solubility of beef stearin in ether at 13°. The requisites are: six 25 c.c. graduated test-mixers fitted with glass stoppers; ether of 0·720 specific gravity; a set of mixtures of pure lard melting at 34 35° with 5, 10, 15, and 20 per cent. of beef stearin melting at 56°; a second set of mixtures of pure lard melting at 39–40° with beef fat melting at 50°.

The melting-point of the sample is taken by the capillary tube method 24 hours after the tube has been filled. Suppose the melting-point to be at 34°, 3 c.c. of the melted fat is run into one of the test-mixers and dissolved in 21 c.c. of ether, then placed in water at 20–25°. 3 c.c. of each of the first set of mixtures is dissolved in exactly the same way. The five tubes are then cooled down to 13° and allowed to remain at that temperature (particu-

larly towards the last) for 24 hours. The apparent volume of deposit in each tube is then noted, and this will give an immediate clue as to the condition of the sample. The ether is poured off from the tubes as far as possible, and 10 c.c. of fresh ether at 13° is added in each case. The stoppers are inserted, the tubes well shaken, and after the deposit has settled the operation is repeated. The whole contents of the tubes are now transferred to weighed shallow beakers. The ether is carefully run off, and the deposits are dried for 15 minutes at 10°. The beakers are cooled and weighed, and the standard weight nearest to that of the sample is used as the factor by which to calculate the beef fat. For samples with a higher melting-point, the second set of mixtures should be used. The actual presence of beef fat must be proved by the microscope. For this purpose, a few particles of the dry residue are placed on a slide, moistened with alcohol, and covered. Very moderate pressure should be applied to the cover, and the slide viewed with a 1-inch objective and the C eye-piece. The presence of beef stearin may often be recognised by the naked eye.

As regards pure lard, the author is enabled to state that no sample melting below 39° gives more than 0·011 gram of ether-washed deposit. A sample melting at 45·8° gave, however, 0·146 gram of deposit. This shows the necessity of having the two sets of standard mixtures and carrying out the analysis by a strict comparison test. Direct experiment has shown that neither cotton oil, palm-nut-kernel oil, nor cocoa-nut oil, interferes with the deposition of the crystals of beef stearin.

Identification, and Tests for the Purity of Lanolin. M. Astolfi. (*Apotheker Zeitung*, 1894, 94.) Lanolin may be identified by the following test, which also serves to indicate the purity of the sample. 0·1 gram of lanolin incorporated with 10 c.c. of pure concentrated sulphuric acid gives an intensely red liquid with a greenish fluorescence, the depth of colour depending upon the purity of the lanolin; if 10 c.c. of chloroform be added to the above, well agitated with it and allowed to separate, the chloroform layer will have a bright red colour, while at the line of contact of the two liquids a black line will be noticeable. These results, when compared with those obtained with pure lanolin, will indicate the purity of the sample examined.

Assay of Indigo. F. Ulzer. (*Chem. Centr.*, 1893, ii. 597.) About 1 gram of the very finely powdered sample is boiled for 10 minutes with 50 c.c. of 5 per cent. aqueous soda and 10 c.c. of hydrogen peroxide. After cooling, it is diluted to twice its volume

with water, and filtered through a tared filter. The precipitate is washed with hot water, then with dilute hydrochloric acid (1 to 10), again with hot water, and finally with boiling alcohol until the filtrate is pale blue. The precipitate is then dried at 100°, weighed and incinerated, in order to weigh and subtract the small amount of ash. If the alcoholic filtrate is evaporated to dryness, and the residue heated at 100° until constant, the amount of indigo-red is approximately found.

This method is stated to be independent of the other organic matters accompanying the indigotin, and therefore to give good results even with indigos of low percentage.

MATERIA MEDICA AND PHARMACY.

PART II.

MATERIA MEDICA AND PHARMACY.

Report on Two Samples of Ipecacuanha. J. Attfield. (*Pharm. Journ.*, 3rd series, xxiv. 48.) The two samples of so-called ipecacuanha reported upon by the author were found to contain, in round figures, two-thirds only of official ipecacuanha (roots), and one-third of ipecacuanha stems. One of these samples was found on analysis to yield 1·95 per cent. of alkaloid, and 9·3 per cent. of moisture. The roots contained in this sample gave 2·02 per cent. and the stems 1·89 per cent. of alkaloid, while the moisture in roots and stems amounted to 9·9 and 8·1 per cent. respectively. The second sample yielded 1·82 per cent. of alkaloid, the roots alone 2·0, and the stems 1·46 per cent. The moisture in the whole sample amounted to 9·3, that in the roots to 10, and that in the stems to 8 per cent.

The author recommends that, pending the development of more exact knowledge respecting "emetine" and the introduction of an authoritative process for the standardization of ipecacuanha, analysts engaged in this assay should extract the drug with cold ammoniacal chloroform first, and hot afterwards, and conduct any evaporation at as low a temperature as possible. In this manner, maximum and fairly concordant results as regards any one sample analysed by different chemists may be expected. He also points out that, in future, the percentage of "emetine" may not be the only guide for judging the therapeutic value of ipecacuanha, since it has been ascertained that roots from which the alkaloid is removed are still possessed of medicinal virtues.

The Chemistry of Ipecacuanha. B. H. Paul and A. J. Cownley. (*Pharm. Journ.*, 3rd series, xxiv. 61–63.) The authors give a preliminary report of their researches which are not yet completed. From the examination of a number of different samples of ipecacuanha they have ascertained that the alkaloid existing in this drug is for the most part a perfectly amorphous

substance, of marked alkalinity, forming definite neutral salts which are also amorphous, and are uncrystallizable like the base they contain. They further find that this amorphous alkaloid is associated with others which are distinctly crystalline and very different from the amorphous base in physical characters. This observation serves to account for some of the discordant statements made by Kunz, Lefort, Wurtz, Podwysotzki and others with regard to the alkaloid of ipecacuanha. The crystalline base referred to is found to be very much less soluble in ether, chloroform, or benzene than the amorphous alkaloid with which it is associated; but it is not until separation has been carried to some considerable extent that this difference becomes apparent. The quantity of material disposed of in the operations of fractional crystallization or precipitation, requisite for separating the alkaloids, proved to be so great as to leave but an insufficient amount for a fuller examination and the completion, for the present, of the authors' research.

The stem of Brazilian ipecacuanha is stated by the authors to contain a small proportion of the same amorphous alkaloid that is present in the root; but it is found to be accompanied by a relatively much larger proportion of a distinctly crystalline base than is obtainable from the latter. It follows, therefore, that determinations of the amount of alkaloid, as a whole, in the stem will not correctly express the relations of stem and root in regard to the amount of emetine, and that, in the present state of knowledge, no inference can be drawn from such determinations as to the relative values of those portions of the plant as medicinal agents. Meanwhile it is pointed out that, apart from the absence of official recognition, there is no ground for the assumption that ipecacuanha stems possess properties justifying their admixture with the roots.

As to the relative value of other kinds of ipecacuanha, it has been stated that the Carthagena root is equal to, if not better than, the Brazilian at the present time. This opinion is based upon the amount of alkaloid obtained from the Carthagena drug, and on the assumption that this alkaloid is identical with that contained in Brazilian ipecacuanha. The authors have obtained evidence, however, that Carthagena ipecacuanha contains, in addition to a considerable amount of amorphous alkaloid, some proportion of another crystallizable base, presenting marked differences from the crystalline alkaloid of the Brazilian drug. They therefore consider it unjustifiable, for the present, to advocate the substitution of the one for the other upon the ground

of possible similarity of origin or of apparently analogous medicinal characters.

In conclusion the authors refer to the striking absence of agreement between the data obtained by different investigators in determinations of the alkaloid in ipecacuanha, and to the different opinions consequently held as to the amount of emetine in the drug. They consider that the facts already established by them as to the existence of distinct alkaloids, in regard to which some solvents exercise a differentiating action, may account for some of the differences between experimental results previously obtained, and further that such differences may also arise from the want of preserving, throughout the entire treatment, conditions which are suited to the characters of the material operated upon, and of the substance to be obtained from it. From their own experience they are inclined to the conclusion that the amount of alkaloid in ipecacuanha root does not deviate very much from 2 per cent., as shown by the results given in the following table:—

No.	Total Mixed Alkaloids. Root.	Stem.
1	2·02	—
2	1·95	—
3	2·14	—
4, picked	2·12	—
5 „	—	0·97
6	2·08	—
7	2·03	—
8, picked	2·28	—
9 „	—	1·76
10	2·22	—
11, picked	—	1·02
Mean	2·11	1·25

The picked samples consisted entirely of either root or stem respectively. The other samples of root were operated upon without separating any admixture of stem that might be present; but it was not in any case sufficient to affect the result very materially. Two of the samples of stem were carefully picked to separate any particles of root; but the sample No. 9 was found, after the analysis had been completed, to contain a considerable admixture of portions of root-bark, a circumstance probably accounting for the higher amount of alkaloid obtained in that instance.

The Assay of Ipecacuanha. C. C. Keller. (*Schweiz. Wochenschr. für Pharm.*, 1893, 470.) The author describes two

modifications of the process previously recommended by him (see *Year-Book of Pharmacy*, 1893, 122).

1st method.—12 grams of the powdered air-dried drug is extracted in a suitable apparatus with ether to remove the fat. It is then transferred to a counterpoised 200 c.c. flask and mixed with more ether, so that the weight of the latter shall be 90 grams. 30 grams of chloroform are then added, and after five minutes 10 c.c. of a 10 per cent. ammonia solution, and the whole is shaken vigorously for half an hour. 10 c.c. of water is now introduced, and after again shaking for a few minutes, 100 c.c. of the clear solution is poured off; the ether and chloroform are removed by distillation, the residue is washed a few times with a small quantity of ether, then dried for 15 minutes in the water-bath, weighed, and titrated with N/10 hydrochloric acid, 1 c.c. of which equals 0·0254 gram of emetine.

2nd method.—12 grams of the powder is put into a dry bottle and repeatedly shaken with 90 grams of ether and 30 grams of chloroform. After 5 minutes, 10 c.c. of ammonia is added, and after half an hour 10 c.c. of water; 100 c.c. of the clear liquid is then poured off and shaken in a separating funnel three times in succession with 25, 15, and 10 c.c. of 1 per cent. hydrochloric acid. The acid layer is then made alkaline with ammonia and agitated twice with 50 c.c. of a mixture of 3 parts of chloroform and 2 parts of ether. The solvent is removed by distillation and the residue finally titrated as before.

The examination of 11 samples gave the following results:—

		Weighed.	Titrated.
1*a*.	Best Rio ipecacuanha .	3·0	2·921
1*b*.	„ „ „ .	3·010	2·916
2.	Powdered Rad. ipec. sine legno	2·790	2·692
3.	Rio ipecacuanha . .	2·063	2·057
4.	„ „ . .	2·122	2·1082
5.	„ „ much wood and stalk . . .	1·980	1·816
6.	Powdered drug . . .	2·730	2·611
7.	Rio ipecacuanha . .	2·910	2·895
8.	Carthagena ipecacuanha .	2·950	2·921
9.	Rio ipecacuanha . .	2·840	2·717
10.	Carthagena ipecacuanha .	2·050	2·032
11.	„ „ .	1·610	1·575

From these results it is inferred that the best qualities of ipecacuanha contain as much as 2½ per cent. of alkaloid and upwards. Owing to the great difference in the proportion of

alkaloid between the cortical and the woody portion of the root, the author advocates the separation and rejection of the central woody portion of the root in the process of grinding.

Assay of Ipecacuanha. A. Grandval and H. Lajoux. (*Journ. de Pharm.* [5], xxviii. 99 103 and 152–156.) The powdered root is extracted with a mixture of alcohol and ether (3:8 parts), rendered ammoniacal by the addition of ammonia solution (2 parts), and washed with ether. The ethereal solution is agitated with a little dilute sulphuric acid, separated, and washed until free from alkaloid. The acid solutions are mixed, rendered alkaline with soda, and again extracted with ether. The ethereal extract, on evaporation, yields the alkaloid in a nearly pure state.

Ipecacuanha from Various Sources. J. Moeller. (*Pharm. Rundschau*, xii. 104. From *Pharm. Journ.*) The author observes that Carthagena and Rio ipecacuanha can be distinguished from one another by the difference in the size of the starch grains, those of the former variety being about twice as large as those of the latter; but a marked differentiation of the cortex of the Carthagena root into two layers, as described by Karsten, could not be detected. The "striated" ipecacuanha with dense wood and sugary cortex differs from Carthagena ipecacuanha only in containing sugar instead of starch. The author considers that the two roots are probably derived from the same plant, but have been collected at different periods. He compares them to the autumn and spring belladonna roots, and finds confirmation of his supposition in the absence of alkaloid from the sugary (spring) root. The author has also examined the false Indian ipecacuanha, and contests Nevinny's opinion that it is the rhizome of *Helonias dioica*; the latter is a North American plant, and differs in anatomical structure from the Indian root. The latter the author considers to be the rhizome of a plant belonging to the natural order Aroideæ.

Carthagena Ipecacuanha. C. Hartwich. (*Zeitschr. des oesterr. Apoth. Vercin.*, xxxii. 345.) The author distinguishes two varieties of the Carthagena drug. One of these shows distinct medullary rays, and its compound starch grains consist of component granules not exceeding four in number; while in the other variety as many as eight component granules may be counted in the compound grains. The latter variety is the one more commonly met with.

A False Sarsaparilla. C. Hartwich. (*Archiv der Pharm.*, ccxxxi. 42. From *Pharm. Journ.*) The author describes a false sarsaparilla from Jamaica, which has recently appeared at Hamburg. It is described as consisting of cylindrical pieces of root,

measuring up to nineteen inches in length and three-sixteenths to three-quarters of an inch in thickness, and brown or greyish brown in colour. The larger pieces were covered with projections which proved to be small galls. The cortex of the root contained numerous schizo-lysigenous ducts, which were surrounded by a sclerenchymatous sheath, and in the earlier stages were filled with resin. The central column showed a very small pith, radial fibro-vascular bundles, and numerous resin ducts. The root was identified by these characters as a *Philodendron*, but the species could not be determined.

A Spurious Senega. A. Andrée. (*Apoth. Zeitung*, ix. 23.) The drug described by the author was obtained from a New York house, and consisted partly of a kind of senega root, differing from the genuine drug in being harder, more fibrous, and almost entirely devoid of the keel which is so characteristic of the latter. In addition to this false senega, the drug was found to contain an admixture of undulated ipecacuanha root (*Richardsonia scabra*). The author suggests that this senega may possibly be the produce of a distinct species of *Polygala*, growing in the same districts as the *Richardsonia*, and that the admixture of the latter may be accounted for by the assumption that the two roots were collected simultaneously.

Scopola Carniolica. E. Schmidt. (*Apoth. Zeitung*, ix. 6.) The author has identified cane-sugar as one of the constituents of this root. In other respects his examination of the drug shows no material difference in the nature of the constituents as compared with those formerly obtained from the roots of *Scopola atropoides*, *S. Japonica*, and other species.

Mexican Valerian. R. McLaughlin. (*Amer. Journ. Pharm.*, July, 1893.) This variety of *Valeriana officinalis* is very commonly found in the woods and damp places of Eastern Mexico. It has a perennial root, an erect channelled stem, and is from three to six feet high. The flowers are white or pink and slightly odorous; the fruit is a capsule containing one oblong ovate seed; the leaves of the stem are attached by short broad sheaths, the radical leaves being larger and standing on long footstalks.

The roots are found in the Mexican market, either in slices or fleshy discs, from one half to one and a half inches in diameter, or in voluminous tubers. They are greyish externally, yellowish internally, hard and tough, breaking when dry with a granular fracture. They possess an unpleasant odour and bitter taste.

Upon analysis the constituents of the root were found to be as follows:—

Volatile Oil	3·33
Oleoresin	4·30
Wax and Fat	1·09
Valerianic Acid	0·91
Mucilage	4·50
Pectin	1·35
Undetermined Extractive	22·80
Pararabin	1·15
Lignin	9·68
Cellulin	30·84
Loss	1·70
Moisture	11·65
Ash	6·70
	100·00

In addition to these, distinct indications of a crystalline glucoside were obtained. The amount of volatile oil found in the above analysis was considerably larger than that occurring in the European variety, a result which was confirmed by further experiments.

Dorstenia Contrayerva. U. Mussi. (*L'Orosi*, xvi. 259-263; *Journ. Chem. Soc.*, May, 1894) The author has examined the roots of the *Dorstenia contrayerva*, a Brazilian plant which is used as an antidote to the poison of serpents and as an antiseptic; he has extracted from it two amorphous substances, which he terms *cajapin* and *contrayervine*, the reactions of which are given. The latter substance yields a white, amorphous *tartrate*.

American Ginseng. (*Kew Bulletin*, lxxvii. 71.) The root of the ginseng plant occupies an important place in the Chinese materia medica on account of its tonic and stimulant properties. It has an aromatic bitter-sweet taste, and is somewhat mucilaginous. Corean ginseng (*Aralia quinquefolia*, var. *Ginseng*) is most esteemed, but the produce of the American plant (*A. quinquefolia*) is largely used as a substitute for it. This root is tuberous, three or four inches long, and usually branches into two or three tap-shaped divisions. It is wrinkled by parallel transverse ridges, gives rise to a number of fibrous rootlets, and the upper portions of the tuber show several angular scars, the remains of withered stems. The older roots often assume strange forms, and are highly prized accordingly. The question of cultivation is now under con-

sideration, and seeds have been received at the Royal Gardens, Kew, for experimental purposes.

Narcissus Orientalis. L. Robechek. (*Amer. Journ. Pharm*, 1893, 369, 370.) This winter-blooming plant, popularly known as the "Chinese lily," belongs to the natural order *Amaryllidaceæ*. The bulbs have been chemically examined by the author, and found to contain small quantities of an alkaloid and of a glucoside. The former was obtained in colourless, acicular crystals, of which the moist bulbs yielded about 0·02 per cent., but the dry drug yielded proportionately less, probably owing to decomposition caused by the heat employed in the process of desiccation. In addition to these principles the fresh drug was found to contain 52 per cent. of moisture, 3 per cent. of ash, 9·5 of mucilage, 7 of lignin, 16·6 of cellulose, 3 per cent. of sugar, and small quantities of resin and pectin.

Aconitum Septentironale. H. V. Rosendahl. (*Apotheker Zeitung*, ix. 112.) This plant occurs in Norway, Sweden, Russia, and some parts of Austria. It has blue or white flowers, but otherwise closely resembles *Aconitum lycoctonum*. The author has made a chemical examination of the rhizome, and has isolated from it three alkaloids, one of which, "lappaconitine," $C_{31}H_{48}N_2O_8$, crystallizes in hexagonal prisms melting at 205°, and dissolves in alcohol or ether with a reddish-violet fluorescence. It is coloured yellowish-red by sulphovanadic acid, the colour changing to green. The two other bases are amorphous. "Septentrionaline," $C_{31}H_{48}N_2O_9$, fuses at 128·9° C., is very soluble in alcohol and ether and slightly so in water, and has a bitter taste and a local anæsthetic action. It produces a cherry-red coloration with furfurol sulphuric acid. By the action of alkalies both this and the crystalline base referred to yield several other alkaloids as well as acid products. "Cynoctonine," $C_{36}H_{57}N_3O_{13}$, fuses at 137°, is readily soluble in water and alcohol, but only very slightly so in ether. When evaporated with fuming nitric acid it leaves a residue, turning blood-red with alcoholic potash.

Asphodel Root, an Adulterant of White Hellebore. H. G. Greenish. (*Pharm. Journ.*, 3rd series, xxiv. 873, 874.) The drug reported upon by the author consisted of a quantity of a rhizome and roots, both loose and attached, which had been found in a bale of white hellebore imported from Genoa, and collected in Northern Italy. It is described as follows:—

This rhizome varies considerably in size, measuring usually about one and a half inches in length, and half an inch in thick-

ness; it is erect, or nearly so, and often crowned with the brownish remains of smooth amplexicaul leaf bases, or sometimes with the fibres left after their decay. It is dark-brownish externally, yellowish internally, showing very numerous glistening groups of raphides and irregular fibrovascular bundles.

To this rhizome numerous roots, varying generally from three to six inches in length, are attached; near to the rhizome they exhibit a fusiform tuberous enlargement two to four inches long and three-eighths to three-fourths of an inch thick, tapering abruptly to about crow-quill size, and thus assuming the shape of an Indian club. These roots are also dark brown in colour, much shrunken and wrinkled longitudinally and transversely; they are more or less spongy, yellowish-brown, and frequently moist internally, showing under the lens a distinct cortical portion separated from a central column by a complete ring of tissue. The taste is sweetish.

The fusiform enlargement of the roots sufficiently distinguishes this drug from white hellebore; the rhizome is easily recognised by its yellowish colour (internally), spongy texture, and abundance of raphides.

A detailed description of the structure exhibited by transverse sections is given and elucidated by two woodcut illustrations, for particulars of which reference should be made to the original account. The drug proves to be monocotyledonous, and probably liliaceous. As the result of comparisons, the author is inclined to regard this drug as the produce of *Asphodelus albus*, a plant widely distributed over Southern Europe.

Although the root of the white asphodel is not now used in medicine, it (or that of the closely allied *A. ramosus*) enjoyed a considerable reputation among the Greeks and Romans. The root is said to contain a volatile substance, bassorin, starch, and so much cane-sugar as to have offered sufficient inducement to cultivate it as a sugar-producing plant, whilst its medicinal properties were supposed to have been diuretic and aperient.

Constituents of the Squill, Scilla Maritima (Urginea Scilla). S. Waliszewski. (*L'Union Pharm.*, xxxiv. 251.) In this paper the author confirms and augments the results of his previous researches, and now claims to have established the presence of four distinct bitter, crystallizable principles. The *scillitine* previously described by him requires further purification by washing with water and subsequently with chloroform. To the first it yields a soluble principle for which the name *scillapicrin* is sug-

gested, while the chloroform removes a body described under the name of *scillamarin*. The fourth principle is still under investigation. It is freely soluble in water and insoluble in alcohol, and its isolation appears to present considerable difficulty.

Cochlearia Armoracia. G. Sani. (*Journ. Chem. Soc.*, November, 1893, from *Real. Accad. Linc.*) Horse-radish contains a glucoside, which undergoes hydrolysis when the crushed roots are digested with water for twenty-four hours. After subsequent extraction with ether, an essential oil containing allylthiocarbimide is obtained. Evidence is thus afforded that the root contains potassium myronate.

Commercial Jalap and Jalapin. C. E. Robinson. (*Pharm. Journ.*, 3rd series, xxiv. 531, 532.) The author has examined ten samples of jalap root, obtained at different places, ranging from high-class pharmacies on the one hand to grocers and stores on the other. All the samples were treated in the same manner, being extracted with spirit by continuous percolation in an extracting apparatus, the spirit evaporated, and the remaining resin washed in water, to get rid of saccharine and colouring matter, dried and weighed. The resins were afterwards treated with ether until exhausted, and the residues again dried and weighed to ascertain the amount soluble in ether. The results are given in the following table :—

Sample.	Percentage of resin.	Portion of resin soluble in ether.
A	7·57	27·16 per cent.
B	12·16	9·42 „ „
C	16·9	8·33 „ „
D	12·07	11·35 „ „
E	9·91	11·55 „ „
F	11·82	16·46 „ „
G	10·20	17·73 „ „
H	17·7	9·0 „ „
I	12·19	22·96 „ „
J	9·87	20·06 „ „

From these results, samples B, C, and H seemed to be very good jalaps, D and E very fair, the remainder all very suspicious, and some very bad. With the exception of A, all yielded a very good percentage of resin, but the large proportion of that resin which was soluble in ether would, in some cases, point to the admixture of some unofficial jalaps or other adulterations.

The commercial substance known as "jalapin" is generally pre-

pared by extracting the powdered jalap with alcohol, adding water until slightly turbid, and then adding animal charcoal. After digesting and boiling for some time, the tincture is filtered off, evaporated to dryness, and the residue washed with hot water to remove gummy and saccharine matter, and then again dried. It is therefore nothing more or less than pure decolorized resin of *Ipomœa purga*.

The author has estimated five samples of this "jalapin," and the results show that they have all been obtained from true jalap, *Ipomœa purga*. They were first dried at 100° C. for an hour, and then treated with ether until exhausted of ether soluble resin, and again dried until the weight remained constant, and then weighed.

Sample.	Moisture.	Soluble in ether.	Insol. in ether and sol. in S.V.R.	Insol in ether and insol. in S.V.R.
1. . .	6·29 p.c.	4·63 p.c.	89·08 p.c.	none
2. . .	6·64 p.c.	4·22 p.c.	89·14 p.c.	,,
3. . .	6·33 p.c.	3·79 p.c.	89·88 p.c.	,,
4. . .	6·84 p.c.	5·67 p.c.	87·49 p.c.	,,
5. . .	6·08 p.c.	5·80 p.c.	88·12 p.c.	,,

In conclusion, the author alludes to the often discussed difference in the meaning with which the names jalapin and convolvulin are used in England and on the Continent, and to the confusion occasionally arising therefrom.

Constituents of the Tubers of Stachys Tuberifera. A. v. Planta and E. Schulze. (*Archiv der Pharm.*, cxxxi. 305-313.) Compare also *Year-Book of Pharmacy*, 1893, 128. The authors have previously shown that these tubers contain, in addition to several carbohydrates, a nitrogenous base, *stachydrine*, $C_7H_{13}NO_2$. A further description of this alkaloid is given in the present paper, in which it is also stated that this base is associated with very small quantities of another nitrogenous alkaloid which is still under investigation. Neither of the two bases appears to be distinguishable from betaïne by the ordinary alkaloidal reagents.

Constituents of the Root of Corydalis Cava. M. Freund and W. Josephy. (*Liebig's Annalen*, ccIxxvii. 1-19.) Compare also *Year-Book of Pharmacy*, 1893, 124. Further information is supplied in this paper respecting the properties of the basic constituents previously described under the names of *corydaline*,

bulbocapnine, and *corycavine*. The formula for bulbocapnine as given before is found to be incorrect, and is now altered to $C_{19}H_{19}NO_4$.

Corybulbine, an additional base isolated by the authors from commercial corydaline, is stated to differ from Dobbie and Lauder's corytuberine in being insoluble in water. Lack of material precluded the determination of its formula.

Assay of Hydrastis Canadensis. C. C. Keller. (*Apotheker Zeitung*, 1894, 133.) The crude alkaloid is extracted from the drug by either of the processes described by the author for the assay of ipecacuanha root (see p 128). The crude base obtained from 12 grains of hydrastis is dissolved by heat in a mixture of 8 c.c. of alcohol and 4 c.c. of ether in a flask, and gradually mixed with 20 c.c. of water; after standing for 24 hours almost the entire quantity of hydrastine will have crystallized out, and is now removed to a filter, washed with about 6 c.c. of cold water, then returned to the flask, dried and weighed. Berberine can be extracted from the drug, previously extracted with ether, by the use of alcohol and precipitating as nitrate or tri-iodide.

Examination of Commercial Specimens of the Root of Hydrastis Canadensis. F. A. Thompson. (*Amer. Journ. Pharm.*, 1893, 370–372.) Golden Seal is known to contain three alkaloids, viz., hydrastine, $C_{21}H_{21}NO_6$, berberine, $C_{20}H_{17}NO_4$, and canadine, $C_{21}H_{21}NO_4$, of which hydrastine is the most important constituent. The proportion of canadine being very small, it has been left undetermined in the author's comparative examination of nine specimens of the drug. His results are given in the following table:—

Samples of ground drug.	Per cent. berberine calculated from dried (105° C.) berb. muriate.	Per cent. hydrastine by weight.	Per cent hydrastine by titration with N-100 H_2SO_4.
1	3·3	2·0	1·76
2	4·15	2·8	2·50
3	3·13	2·52	2·3
4	3·24	2·32	2·1
5	3·48	2·7	2·5
6	3·89	2·48	2·25
7	4·06	2·8	2·5
8	3·0	2·3	2·18
9	3·1	2·3	2·16
Average	3·48	2·47	2·27

These results are higher in berberine and hydrastine than those recorded by previous investigators. At the same time they show a fair amount of constancy in the quality of the root met with in commerce.

The author has also examined a number of samples of fluid extract of this drug, U.S.P., with the following results:—

Samples of fluid extract, U.S.P.	Per cent. berberine calculated from dried (105° C.) berb. muriate.	Hydrastine by weight.	Hydrastine by titration with N-100 H_2SO_4.
1	2·15	2·2	1·96
2	2·7	—	2·5
3	1·88	1·36	1·22
4	2·52	1·98	1·87
5	2·52	—	2·45
6	1·73	1·3	1·16
7	1·89	1·71	1·62
Average	2·20	1·71	1·82

The following results were obtained in the examination of six samples of the so-called non-alcoholic fluid extract of hydrastis:—

Samples of non-alcoholic extract.	Per cent. berberine calculated from dried (105° C.) muriate.	Per cent. hydrastine, by titration with volumetric acid.
1	1·46	1·3
2	2·	1·3
3	0·65	0·61
4	0·66	0·46
5	0·12	0·72
6	0·54	0·69

Datisca Cannabina. E. Schunck and L. Marchlewski. (*Liebig's Annalen*, cclxxvii. 261-276.) By extracting the bruised roots of *Datisca cannabina* with dilute alcohol, distilling off the alcohol, extracting the residue with water, treating the aqueous solution with a small quantity of lead acetate, and concentrating the filtrate, the authors obtained crystals of datiscin, which, after purification by recrystallization from boiling water, were found to melt at 190° C., to have the composition $C_{21}H_{24}O_{11} + 2H_2O$, and to agree in their general properties with the description given by Stenhouse. This body, when boiled with dilute sulphuric acid,

yields datiscetin, and a sugar, which is not glucose, as Stenhouse supposed, but rhamnose.

A Chemical Examination of the Root and Leaves of Abrus Precatorius. D. Hooper. (*Pharm. Journ.*, 3rd series, xxiv. 937, 938.) The seeds of *Abrus precatorius* are well known under the names of "jequirity" and "rati," and have been pretty thoroughly examined with regard to their chemical composition and physiological properties. The root of this plant has been described as a good substitute for liquorice root, and has been called wild, or Indian, liquorice. It is very hard and woody, and much branched. The larger pieces are about half an inch in diameter, gradually tapering, and very brittle. The colour is reddish-brown. The cortical layer is very thin, and the woody portion yellowish-white. Only the root-bark had a slight disagreeable taste, and no distinct sweetness was perceived in the crude drug.

The leaves are abruptly pinnated, like many other leguminous plants, and have eight to twenty pairs of leaflets. The leaflets are linear oval, obtuse at both ends, glabrous, membranous, deciduous, $\frac{3}{8}$ to $\frac{5}{8}$ of an inch long, and $\frac{1}{6}$ to $\frac{1}{5}$ of an inch broad. The taste is sweet, like liquorice, but they have no odour whatever. The sweet principle of these leaves was observed by Berzelius so long ago as 1827, but no examination or estimation of this principle appears to have been made.

The chief constituent of the root was a resin acid amounting to about 8 per cent., which was found to be soluble in ethyl and amyl alcohols, chloroform, carbon bisulphide, and strong alkalies. With strong sulphuric acid it formed a fine green and with nitric acid a yellow solution. In addition to this resin acid the root proved to contain about one and a half per cent. of glycyrrhizin and small quantities of an alkaloid and an organic acid.

The leaves were submitted to a proximate analysis with the following results:—

Chlorophyll and fat	4·78
Glycyrrhizic acid	10·21
Albuminoids	16·56
Gum and colouring matter	3·90
Fibre	16·65
Mineral matter	10·20
Water	7·70
	100·00

The leaves are thus shown to contain a larger proportion of glycyrrhizic acid even than liquorice root.

Detection of the Adulteration of Ginger with Exhausted Ginger. A. H. Allen and C. G. Moor. (*Analyst*, xix. 124.) Dyer and Gilbard (*Analyst*, xviii. 197) found the proportion of soluble ash from genuine ginger to vary from 1·9 to 3 per cent., with an average of 2·7; while W. C. Young found in seven authenticated samples of ginger a range of 1·8 to 2·6 for the soluble ash. Similar results have been obtained by Pearmain.

In the hope of finding a solvent which would dissolve the valuable portion of ginger without affecting the objectionable resinous matters, the authors have examined the action of cold water, proof-spirit, and rectified spirit on a number of samples of ground ginger of commerce. Results were obtained as shown in Table 1, p. 140.

From these results it appears that the percentage of matter extracted either by proof or rectified spirit affords very little information, the large proportion of resinous matters yielded both by genuine and exhausted ginger masking any minor differences.

On the other hand, the proportion of extractive matter yielded to cold water seemed more encouraging, since the amounts dissolved in most cases followed closely the proportions of soluble ash. For the figures which were obtained by the analysis of genuine ginger of known origin, see Table 2, p. 140.

The inference is drawn that neither the soluble ash nor the cold-water extract affords by itself a perfectly safe means of deciding as to the presence of exhausted ginger, but that by a combination of the two data it is possible to arrive at a more definite conclusion.

Chionanthus Virginica. W. v. Schulz. (*Chem. Centr.*, 1893, ii. 820, 821 and 866, 867.) The author has examined the root-bark of the Virginian snowflake (*Chionanthus virginica*), and has isolated from it a glucoside of the formula $C_{32}H_{38}O_{19} + 2H_2O$, crystallizing in silky white spangles, which turn reddish-violet when heated above 110° C. This glucoside (*chionanthin*) differs in its general properties from saponin, and does not appear to be very poisonous. On boiling with dilute acids it yields a reddish-brown decomposition product along with glucose.

A Study of the Structure of Canella Bark. H. G. Greenish. (*Pharm. Journ.*, 3rd series, xxiv. 793–797.) The author gives an interesting account of his examination of canella barks from various sources, from which it appears that the structure of this

TABLE 1.

	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.	L.	M.
Total ash	3·54	5·23	4·41	5·15	5·58	7·69	5·39	3·61	3·19	2·72	3·52	3·29	4·50
Ash soluble in hot water	2·36	2·59	2·22	2·57	2·87	2·36	—	1·24	1·45	0·69	1·11	0·97	1·37
Alkalinity of soluble ash as K_2O	0·96	0·96	0·29	0·13	0·15	0·20	—	0·27	0·20	0·23	0·23		
Extracted by rectified spirit	7·33	7·70	7·37	6·22	8·45	—	4·65	7·09	—	6·88	7·86		
Extracted by proof spirit	21·64 20·25	20·80 18·58	10·70	10·45	7·55	21·60	5·85	13·00	16·08	11·78	12·38		
Containing ash	—	2·73	—	—	—	—	—	2·30	2·47	1·91	2·24		
Extracted by cold water	14·57	13·16	14·95	14·55	14·50	14·60	8·14	8·33	9·78	8·51	7·18	8·08	7·39
Extracted by subsequent treatment with proof spirit	9·77	9·59	—	—	—	7·49	—	8·35	8·51	7·76	8·42		
Extracted by subsequent treatment with rectified spirit	1·11	1·28	—	—	—	1·31	—	1·58	0·98	1·28	1·71		
Total extract by three solvents used consecutively	25·45	24·03	—	—	—	23·40	—	18·26	19·27	17·55	17·31		

TABLE 2.

	N.	O.	P.	Q.	R.	S.	T.	U.	V.	W.	
Origin of Ginger.	Jamaica.	Jamaica.	Jamaica.	Jamaica.	Jamaica.	Cochin.	Cochin.	Cochin.	African.	African.	Average.
Moisture	11·26	10·98	13·95	12·76	13·96	10·64	13·50	13·23	15·97	13·70	13·00
Total ash	—	—	3·90	3·29	3·45	—	3·81	3·62	3·66	3·90	3·66
Soluble ash	1·70	1·41	3·05	1·75	1·71	1·71	2·03	2·04	2·28	2·41	2·01
Cold-water Extract	15·65	13·25	14·40	12·25	11·85	13·00	8·65	11·65	10·80	10·10	12·12

bark is by no means as uniform as has hitherto been assumed. Notable variations are demonstrated by him, the occurrence of which is of importance, inasmuch as it is precisely those barks of more or less abnormal appearance that the histologist is called upon to identify. These variations cannot be ignored without rendering the determinations uncertain. Of special interest is the possible presence of both sclerenchymatous cells and cells with red resin, for both these elements have been regarded as specially characteristic of *Cinnamodendron corticosum*. It follows, therefore, that caution must be exercised in determining the identity of barks exhibiting either one or both of these characters.

The descriptions given are accompanied by woodcut illustrations. For particulars we must refer the reader to the original report, as the description of structural details cannot be satisfactorily dealt with in an abstract.

Blay-Hitam. H. and C. G. Santesson. (*Archiv der Pharm.*, ccxxxi. 591.) The bark known by this name is used in the Malay Peninsula in the preparation of "ipoh arrow poison." The authors' investigation shows that it is derived from a species of *Strychnos*. The alkaloid they isolated from it was found to consist mainly of brucine, and to afford no indication of the presence of strychnine.

The Bark of Populus Tremula. N. Farmakovsky. (*Journ. Russ. Chem. Soc.*, xxiv. 423-439.) The bark yields on dry distillation a strongly acid tar having a specific gravity of 0·956 at 17° C., and requiring for neutralization 3 per cent. of its weight of anhydrous carbonate of potassium. It contains the lower fatty acids, about 17 per cent. of phenols, a small proportion of benzoic acid, and a large quantity of hydrocarbons.

A New Species of Cascarilla. A. W. Southall. (*Pharm. Journ.*, 3rd series, xxiv. 574, 575.) The bark reported upon by the author belongs to the genus *Cascarilla*, and is probably derived from an undescribed species growing in the United States of Columbia. It has a persistently bitter taste, and occurs in pieces from one half to one foot long and about half an inch thick. The external portion is covered by a dark-brown to light-grey cork layer, and is slightly wrinkled longitudinally with occasional transverse cracks. The fracture is splintery and slightly fibrous, showing a slight yellow interior. The internal surface is a rather darker yellow, and shows a number of fine longitudinal furrows.

The histological examination conducted by C. E. Robinson shows that the transverse section exhibits a number of layers of cork six

or more cells deep, inside which are a large number of stone cells tangentially elongated, and, beyond these, bast fibres not so much thickened as those found in *Cinchona*, but like them in the fact that they are short, as seen in the radial section.

The chemical examination of the bark showed the absence of alkaloids and glucosides, and the presence of caoutchouc, saccharine matter, tannin, and an acid resin, soluble in alcohol and ether, and melting at 221° C. This resin appears to be the bitter and active principle of the bark.

Proximate Analysis of the Bark of Juglans Cinerea. E. D. Truman. (*Amer. Journ. Pharm.*, 1893, 426 428.) The author's results are embodied in the following table :—

Solvent used.	Root-bark.	Per cent.	Trunk-bark.	Per cent.
Petroleum ether.	Fixed oil	4·94	Fixed oil	5·98
Stronger ether .	Fixed oil and colourless crystalline resin . . .	2·31	Fixed oil and colourless crystalline resin . . .	2·59
Absolute alcohol	Juglandic acid, extractive matter, etc.	6·94	Uncrystallizable acid, crystalline resin, etc. . . .	7·42
Distilled water .	Dextrin	0·52	Dextrin	0·70
	Mucilage	2·25	Mucilage	0·70
	Glucose	3·05	Glucose	3·84
	Saccharose . . .	1·84	Saccharose . . .	2·06
	Extractive . . .	2·19	Extractive . . .	4·20
Dilute solution of sodium hydrate	Pectin and albuminous matter .	1·68	Pectin and albuminous matter .	1·48
	Colouring matter and extractive .	6·86	Colouring matter and extractive .	2·06
Dilute hydrochloric acid . . .	Pararabin & traces of calcium oxalate	2·62	Pararabin & calcium oxalate . .	4·08
	Lignin	9·22		6·96
	Cellulose	44·26		43·79
Chlorine water .	Moisture	4·60		4·75
	Ash	5·82		5·84
	Loss.	1·10		4·55
		100·00		100·00

Cinnamon and Cassia Barks. R. Pfister. (*Forsch.-Ber. über Lebensm.*, i. 6 and 25; *Pharm. Journ.*, 3rd series, xxiv. 941, 942.) The species studied were *Cinnamomum zeylanicum*, *C. cassia*, *C. iners*, *C. obtusifolium*, *C. burmanni*, *C. tamala*, *C. loureiri*, *C. culilawan*, *C. sintok*, *C. sp. incerta* ("Massoi bark from New Guinea"), and *Massoia aromatica*.

In the examination of these barks, authentic specimens of the stem or bark of the species were obtained and compared with the barks in commerce. As the result of his work the author has constructed the following table of the commercial barks obtained from the genus and sold under the name of cinnamon or cassia:—

I. RAPHIDES ACICULAR, principally in the medullary rays.
  A. *Bast fibres numerous.*
    (*a*) Cells of the sclerenchymatous ring tangentially elongated.
      1. Cells of the secondary parenchyma isodiametric. *C. zeylanicum.*
      2. Cells of the secondary parenchyma tangentially elongated. *C. obtusifolium.*
    (*b*) Cells of the sclerenchymatous ring radially elongated. *C. iners.*
  B. *Bast fibres few.*
    Secretion cells 60–100 μ in diameter; cells of the secondary parenchyma thin-walled; no porous cells. *C. cassia.*

II. RAPHIDES TABULAR.
  A. Cells of the medullary rays with porous thickening. *C. loureiri.*
  B. Cells of the medullary rays usually thin-walled.
    (*a*) Secondary parenchyma thin-walled; no porous cells; sclerenchymatous cells in isolated groups. *C. burmanni.*
    (*b*) Secondary parenchyma with a tendency to sclerosis; porous cells present. *C. tamala.*

A similar analysis of the other barks is not given, but the characters recorded under each may be thus tabulated:—

C. sintok.—Raphides acicular; fibres of the secondary bast *band-shaped*; sclerenchymatous ring *continuous*; *porous cells present.* Stone cells forming *well-defined zones* in the secondary bast.

C. culilawan.—Raphides acicular and hone-shaped; bast fibres *band-shaped*, lignified; sclerenchymatous ring interrupted; *porous cells absent*; stone cells forming *numerous groups* in the secondary bast.

C. species (false Massoi bark).—Raphides acicular; sclerenchymatous ring interrupted, *unequal in width; porous cells*

present; stone cells in rounded *groups only in the outer part* of the inner bark.

Massoia aromatica.—Raphides singly or in pairs, filling the *stone cells* of each group; bast fibres *circular in section, always with oblique slit-like pores*; stone cells isodiametric in groups.

Concerning the geographical sources of the cinnamon and cassia barks, the author considers that cinnamon bark, although cultivated in many tropical countries, is nowhere equal to that of Ceylon. The cassia bark of Sumatra, known as the "Cassia vera Padang," comes exclusively from *C. burmanni*. This species yields cassia also in other islands of the Dutch East Indies, as in Java, etc., also in Timor, and probably also some of the Chinese cassia. It is likewise the source of the red-brown kind of Vogl.

C. tamala affords cassia bark in North India, and therefore probably a good deal of that which comes from Calcutta. The author has also seen bark of this species from Cochin China and China.

C. iners yields a bark constituting probably a part of the cassia from the E. I. Archipelago. The author has also seen it from Bombay.

C. obtusifolium.—This yields bark in Northern India. It has been offered in the London market as cinnamon.

The histological examination of these barks has shown that the bark of *C. burmanni* is identical in structure with that of *C. dulce*, *C. kiamis*, and *C. burmanni* var. *lancolata*; that *C. tamala* and *C. albiflorum* are the same species; that the bark sent by Dymock to the Pharmaceutical Society as that of *C. tamala* belongs to *C. iners*; that the cassia bark from Calcutta is derived from *C. tamala*; that the Saigon cassia of the New York market is the unscraped bark of *C. cassia*; and that the true Massoi bark and the false Massoi bark from New Guinea are quite as distinct under the microscope as they are in odour. He also brings out the curious fact that the "Cassia vera" of the Continent is that of *C. cassia*, whilst in this country it is that of *C. burmanni* and *tamala*, and that the "Cassia lignea" of Continental writers is the bark of *C. burmanni* and *C. tamala*, whilst in London it is that of *C. cassia*; that the China cinnamon of Continental and American authors is the bark of *C. cassia*, and that the China cinnamon of London is the unscraped bark of *C. cassia*, known in New York as "Saigon" cinnamon. This unscraped bark is much more aromatic and pungent than the scraped bark.

Constituents of Coto Bark. O. Hesse. (*Ber. der deutsch. chem. Ges.*, xxvi. 2790–2795.) In the first part of this paper the author discusses the results recently obtained by Ciamician and Silber. Mixtures of "methylprotocotoïn" ("oxyleucotin"), and "methylhydrocotoïn" ("benzoylhydrocoton"), or of "isomethylhydrocotoïn," resemble "leucotin," both in appearance and melting-point, but the melting-point of leucotin is constant, whilst that of the mixture is not.

The remainder of the paper deals with "paracotoïn," "bromoparacotoïn," "paracotoïnic acid," "cotoïn," and "dicotoïn."

Examination of Four Oak Barks from India. H. Trimble. (*Amer. Journ. Pharm.*, 1894, 299–301.) The author has examined the following oak barks:—

Quercus annulata (Inai).
" *incana* (Ban).
" *dilatata* (Moru).
" *semicarpifolia* (Karshu).

The tannin was estimated in these by the "hide" method with the following results:—

Species.	Tannin in air-dry bark.	Moisture.	Tannin in absolutely dry bark.	Ash in absolutely dry bark.
Quercus annulata . . .	11·37	6·85	12·20	11·30
" dilatata . . .	7·40	6·88	7·94	10·02
" incana	22·12	5·31	23·36	11·06
" semicarpifolia .	7·99	7·04	8·60	10·88

The tannins obtained from these barks were submitted to ultimate analysis, and were also closely studied with regard to their characters and reactions. The results show that they are identical with one another, and also identical with species of oaks indigenous to the United States.

Two of the samples were found to exceed in tanning capacity the bark from any of the American oaks, while the other two were equal to the average of the latter.

Myrica Nagi. D. Hooper. (*Amer. Drugg. and Pharm. Record*, May 10th, 1894.) The author calls attention to the large percentage of tannin present in *Myrica Nagi*, which he thinks is identical with Shibuki, a Japanese tree, the bark of which was found by J. Ishikawa (*Chem. News*, December, 1880, 275) to contain from 11 to 14 per cent. of tannin. A sample of this bark, Kaiphal,

from Bombay, was found to contain 11 per cent. of moisture, 7·17 per cent. of ash, and 13·7 of tannin. The lead compound of the organic acid contained 30·72 per cent. of oxide, a result which compares very closely with the amount found in the compound separated from the "Kino," viz., 31·88 and 30·36 per cent. in two estimations. The tannic acid, separated from the tincture by evaporation and treatment with water, gives a bluish-purple colour with ferric chloride, but on adding this reagent to a decoction of the bark a dirty green precipitate is formed. Beyond determining the amount of tannic acid in an authentic specimen of this bark, and obtaining indications of an alkaloidal principle, the author has not had an opportunity for a further examination of the drug.

Cocillana. H. H. Rusby, W. Coblentz, and R. W. Wilcox. (*Pharm. Journ.*, from *Brooklyn Medical Journal*, July, 1893.) The name cocillana applies to a drug obtained from a species of *Guarea* (Meliaceæ), reputed to possess expectorant properties. Only the thicker bark from the trunks and larger branches of the trees is collected. It yields 0·13 per cent. of a white crystalline body, having a peculiar aromatic taste, soluble in ether, chloroform, acetic ether, and glacial acetic acid, but insoluble in alkalies and, when heated with water, melting to oily globules which congeal on cooling. The melting-point of the compound, which is apparently a solid hydrocarbon and requires further investigation, is 80°, and above that point it sublimes. Traces of alkaloid were indicated by Mayer's reagent, and a resin (2·36 per cent.) and fixed oil (2·50 per cent.) were also found, whilst a glucoside is also probably present. The preparations of the bark employed in the clinical investigation were a concentrated tincture, a fluid extract, and a syrup. It is claimed that, in diseases of the respiratory organs, the drug is superior to apomorphine, preferable to ipecacuanha, and safer than pilocarpine.

Certain Spurious Drugs recently Imported. H. G. Greenish. (*Pharm. Journ.*, 3rd series, xxiv. 381–383.)

Senna.

The supposed "senna" reported upon by the author consists of the leaflets of an imparipinnate compound leaf; the petioles are slightly but distinctly winged; the lamina is dotted with oil glands and emarginate at the apex. The transverse section of the midrib taken at about one-third of the length of the leaf from the base exhibits a crescent-shaped principal fibrovascular bundle

with the bast towards the under surface, supplemented by a smaller bundle with the bast directed towards the upper surface of the leaf. In the mesophyll there is one row of palissade cells and an occasional lysigenous oil-gland.

The specimen was stated to come from Tunis and to consist of the leaves of the mastich tree, *Pistacia lentiscus*, but a close structural examination side by side with leaves of the latter showed this not to be the case. In the absence of flower or fruit, the author was unable to definitely determine the botanical source, but he felt inclined to regard it as a species of *Xanthoxylum*, a genus very closely allied to *Pilocarpus*. Subsequent communications from E. M. Holmes and W. T. Thiselton Dyer (*Pharm. Journ.*, 419 and 421) have shown, however, that the leaves are derived from an undescribed but true species of *Pilocarpus*, which Stapf proposes to call *P. microphyllus*.

Matico.

The sample of spurious matico here referred to contained a few tolerably well-preserved leaves of broadly ovate shape and large size, but consisted for the most part of broken leaves closely resembling ordinary matico. The epidermis of the upper surface consisted of one layer of large square cells; there was no hypodermis present, and the oil cells in the mesophyll were very numerous. The epidermis of both surfaces, when separated from the leaf, was seen to consist of cells much larger than those of genuine matico. In the latter the epidermis consists of one layer of tabular cells, and that immediately beneath it is a single layer of colourless hypodermis; there are two rows of palissade cells in the mesophyll, and numerous cells filled with yellowish oil. Near the base the midrib contains a number of fibrovascular bundles separated by colourless parenchyma. The author considers the broadly ovate leaves above described as those of a Piper nearly allied to matico, but not those of *Piper angustifolium*.

Jalap.

The sample of the spurious drug was found to consist of five pieces, representing no less than three distinct roots. One of these was a tapering root containing no secretion cells, but exhibiting an extraordinary number of cells completely filled with raphides distributed throughout the parenchymatous tissue. It does not appear to be of convolvulaceous origin. The second root contained in the cortical portion a number of cells filled with a

clear yellowish resin and oxalate of calcium in agglomerated crystals. Milk-cells as they occur in jalap were absent; the starch grains were seen to be of large size and characteristic shape. Thus it proved to be neither true jalap nor the root of *Ipomœa orizabensis*. The third root contained milk-cells in abundance, oxalate of calcium in agglomerated crystals. The xylem portion of the fibrovascular bundles was well developed and the starch grains small and mostly compound. The latter were much less in size than those of the male or light jalap of *Ipomœa orizabensis*, which it otherwise approaches very closely.

Sarsaparilla.

Four bales of the fictitious drug were shipped from New York and offered as sarsaparilla. It was composed of pieces averaging about three feet in length, very dark-brown in colour, irregularly furrowed, usually flattened, and showing here and there a rootlet as well as the remains of aerial stems. The cortical portion was found to separate easily, and the central column then to split readily into flattened plates.

A structural examination of the transverse section, of which details are given in the report, indicate that the drug is the rhizome of a fern, probably polypodiaceous. It may possibly be a *Pteris* or an *Acrostichum*, and the author considers it as not unlikely that the rhizome described by Goebel and Kunze under the name of *Polypodium calaguala*, which is said to have borne a high reputation in Peru, may have been a similar drug.

Ipecacuanha.

The author has microscopically examined some of the so-called "black" or "striated" ipecacuanha lately occurring in the market, and finds that it approaches nearer in its histological characters to *Richardsonia* than to *Psychotria*.

A New Species of Jaborandi. Pilocarpus Microphyllus, Stapf. T. H. Wardleworth. (*Pharm. Journ.*, 3rd series, xxiv. 506.) The leaves described by the author were received from Maranham in three bales, and constituted part of a consignment of the ordinary jaborandi of commerce. They appear to be identical with the "spurious senna" reported upon by H. G. Greenish (see p. 146). While possessing the general characteristics of jaborandi, the leaves are much smaller, and the emargination at the apex most pronounced. Specimens were forwarded to Kew, and the authorities there decided that the leaves belonged to a new and

distinct species of jaborandi, to which they gave the name of *Pilocarpus microphyllus*, Stapf.

The leaves are imparipinnate, petiole narrowly winged, articulate at the junction of the leaflets; leaflets ¾ to 1½ inch long, oblong-ovate, or oblong-lanceolate, cuneate at the base, deeply emarginate at the apex, evergreen, margins entire or faintly crenate, slightly revolute. The leaflets are coriaceous and possess numerous pellucid oil glands. Histological examination reveals the same structure as other leaves of jaborandi; but the new variety is almost devoid of the stellate hairs on the under surface, which are found in the ordinary varieties.

The alkaloid isolated by Conroy from these leaves is found by him to possess all the chemical properties of pilocarpine.

Ceará Jaborandi. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xxiv. 1065, 1066.) The author calls attention to a new kind of jaborandi from Ceará which has recently occurred in the market. Although belonging to the same genus, this variety does not appear to have the same medicinal value as that of Pernambuco, for when chewed it does not cause a free flow of saliva, but only a pungent taste, which lasts for some little time. The following description is given, by means of which these and several other kinds of jaborandi leaves which have been discussed in the journals may be distinguished from the official drug by the naked eye or with the aid of a lens.

The true jaborandi, *Pilocarpus jaborandi*, which should be distinguished by the name of Pernambuco jaborandi, has coriaceous, oblong-lanceolate leaflets, glabrous on both sides, having an emarginate apex, and slightly unequal at the base. The lateral veins are distinctly prominent on the upper surface. When held up to the light, numerous large oil glands become visible. The tint of the leaves is of a brownish green. The leaflets of *Pilocarpus pinnatifolius*, or Paraguay jaborandi, are usually obovate-lanceolate rather than oblong, of a thinner and more paper-like consistence, of a grey-green hue, and are also furnished with large oil glands. The leaflets of *Pilocarpus microphyllus* are at once distinguishable by their small size, being usually 1–1½ inch long, by their ovate-lanceolate, or almost rhomboidal outline, the leaf being widest below the middle, and one half of the leaf usually larger than the other half, this being especially noticeable near the base of the leaflet. The leaves are quite glabrous, and the apex is deeply emarginate. Large oil glands are present. The leaves of the *Piper* offered as jaborandi are so different in appearance that they

are not likely to be mistaken for the genuine drug. They are ovate-lanceolate and acuminate, of a thin texture, of a greyish-green colour, and possess only extremely minute oil glands.

The new variety of jaborandi from Ceará presents the following features:—The leaflets resemble those of the true or Pernambuco jaborandi in their coriaceous or leathery texture, and in the dark-green or brownish-green colour of the upper surface and in the emarginate apex, but differ in the under surface of the leaf being covered with short, curved, simple, unicellular hairs. On the upper surface these hairs are present on the midrib, but are only sparingly visible elsewhere on the upper surface. The margin of the leaf is also strongly incurved. When chewed it does not cause a free flow of saliva. These characters are only selected for pharmacognostic purposes, the botanical distinctions not being readily available in commercial specimens, for the different species of *Pilocarpus* vary, as a rule, more in the shape, size, and surface of the fruit, and in the relative length of its pedicel, than in the character of the leaflets.

Some fruits are usually present in the commercial article, and these, taken in conjunction with the leaves, show that the plant belongs to a hitherto undescribed species, for which the name *Pilocarpus trachylophus* is suggested. This species differs from *Pilocarpus jaborandi* in the very short pedicels of the fruit, and in the hairy character and yellowish colour of the under surface of the leaf. The fruit differs from that of *P. jaborandi* in its smaller size, and in the absence of the transverse zones or ridges which form so marked a feature in the carpels of that species and of *P. pinnatifolius*. The carpels probably remain adherent until mature, since the contiguous sides are smooth and the back of the carpels only are marked with oblique, warty, undulated ridges. The carpels are compressed and rounded, not angular, at the apex.

The carpels of *P. pinnatifolius* are angular at the apex, so as to present a more truncate appearance; the transverse zones are distinctly visible on the sides of the carpels, and are connected by a network of slender raised lines. In size they resemble those of *P. trachylophus*. The carpels of *P. jaborandi* are $1\frac{1}{2}$ cm. long and nearly 1 cm. broad, with prominent transversely-zoned ridges. The pedicel of the fruit is about 1 cm. long in *P. jaborandi*, 8 mm. in *P. pinnatifolius*, and 2 mm. in *P. trachylophus*. In *P. pinnatifolius* the fruits are very numerous and crowded together; in *P. jaborandi* and in *P. trachylophus* the fruits are sparingly formed, the flowers apparently being very deciduous.

Woodcut illustrations accompany the above descriptions in the *Pharmaceutical Journal.*

Note on the Alkaloid of Ceará Jaborandi Leaves. B. H. Paul and A. J. Cownley. (*Ibid.*, 1066.) The authors have isolated from this drug a small quantity of an alkaloidal substance which does not appear to be identical with pilocarpine.

Alexandrian and Tinnivelly Senna. O. C. Dilly. (From *Amer. Drugg and Pharm. Rec.*, September, 1893.) The author deals with the comparative value for pharmaceutical purposes of Alexandrian and Tinnivelly senna, basing his remarks upon determinations of the cathartic acid contained in each. The average yield of cathartic acid from Alexandrian senna was 0·9 per cent.; that from the Tinnivelly 0·6 per cent. This difference, however, was not the same in the results obtained on separating the cathartic acid of Witte—the substance consisting of magnesium cathartate and calcium cathartate. In addition to containing a larger percentage of the main active constituent, Alexandrian senna appears to be of greater value also in manufacturing the liquid preparations of the drug, inasmuch as it contains a much smaller percentage of gummy matter, and is accordingly easier and more quickly extracted than the Tinnivelly variety. The only advantage possessed by the latter variety, irrespective of its lower price, seems to consist in its finer appearance, being cleaner, unbroken, larger and seemingly fresher.

Physiological Action of different Species of Digitalis. M. Goldenberg. (*Nouv. Rem.*, 1893, 509.) The author finds that the various species of digitalis agree with *Digitalis purpurea* in exercising a similar action on the heart, but there is a considerable difference in the energy of their action. *Digitalis eriostachys*, *D. glandulosa*, and *D. Fontanesii* are only feeble in their action, especially the latter, while *D. nervosa* is distinctly, and *D. ferruginea* very considerably more active than *D. purpurea.* The various organs of the plants contain the active principles in different quantities, the seeds being richest in active constituents, the leaves following next in the order of efficiency, then the membranes of the seeds, and finally the stems.

The Relative Alkaloidal Value of different Parts of Datura Stramonium and Hyoscyamus Niger. L. Dohme. (*Amer. Journ. Pharm.*, 1893, 479.) The author finds that of the various parts of *Datura Stramonium* the stem s richest in alkaloid, the seed coming next in order, then the leaves, and finally the roots. The plants examined were growing wild in the vicinity of Baltimore,

U.S.A., and were gathered during July and August. The parts were separated while fresh, and some assayed undried, the rest being carefully dried, powdered, and assayed within about a week of gathering. The stems, roots, and leaves marked "a" and "b" were all taken from the same plants, gathered in July, but the seed was older and of indefinite origin. The parts marked "c" were from plants collected in August, and some, marked "green," were assayed in the fresh state. The methods employed for the determinations were Lyons' for specimens marked "a," and Dragendorff's for those marked "b" and "c." Dragendorff's method was modified so as to be used as a gravimetric process, and differed from that of Lyons, which did not give such good results merely in the use of dilute alcohol and tartaric acid in the place of Prollius' fluid. The figures obtained were as follows:—

Part of plant used.	Gravimetric percentage.	Percentage by titration of former.
Leaves . . . . . (a)	0·654	0·214
,, ... (b)	0·554	0·231
,, ... (c)	1·420	0·231
,, green . . . . . (c)	1·420	0·271
Stems . . . . . (a)	0·770	0·306
,, ... (b)	1·060	0·358
,, ... (c)	0·931	0·489
,, green . . . . . (c)	1·000	0·467
Roots . . . . . (a)	0·496	0·138
,, ... (b)	0·790	0·173
Seed . . . . . (a)	0·556	0·248
,, ... (b)	0·596	0·289

The percentage of moisture in the plants was found to vary from 75 to 85 per cent., and some slight loss of alkaloid appeared to occur during the process of drying.

A similar investigation of the leaves, stems, roots and seed of *Hyoscyamus niger*, collected in June and imported from Hungary, gave results which seemed to show that the stems and seed contained little or no alkaloid, the roots 0·017 per cent. only, and the leaves 0·173 per cent.

Changes in Tobacco Leaves during Fermentation. S. W. Johnson. (*Exper. Stat. Record*, iv. 910, 911. From *Journ. Chem. Soc.*) Duplicate samples of upper leaves, leaves lower down on the stalks, and best leaves were selected, and in each case one sample was analysed at once; the other fermented before analysis. In fermenting, there was a loss of 9·7, 12·3, and 9·1 per cent. in the

upper, lower, and best leaves respectively, chiefly due, in the case of the lower leaves, to the evaporation of water, but in the case of the upper leaves to loss of dry matter. The best leaves lost about equal amounts of water and dry matter. The loss of nicotine amounted to over one-third in the upper leaves, less than half in the lower leaves, and less than one-sixth in the best leaves. The upper leaves lost over one-seventh of the nitrogen-free extract, and one-fifth of the ether extract. The best leaves lost chiefly nitrogenous matters other than nicotine and nitrogen-free extract, including the "gum" of tobacco.

Piptocalyx Moorei. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xxiv. 977.) The author has examined some leaves imported from Australia, which were offered as a material for use in brewing. The leaves are described as lanceolate acuminate, with an obtuse apex about 7 cm. long by 3 cm. broad, of a thin, but tough and parchment-like consistence, somewhat shining on both sides, and with the veins and even the veinlets extremely prominent on both sides. A very marked character in the leaf is that the margin, which is entire, is thickened by the veinlets running along it, so as to form a kind of double margin. The midrib and principal lateral veins on the under surface of the leaf are furnished with reddish-brown simple hairs. On holding the leaf up to the light it is seen to be studded with numerous translucent dots, variable in size, but all comparatively small. These do not appear to be oil receptacles, since the leaf has no aromatic taste. It is, however, intensely bitter. By these characters the leaf may be easily recognised. On examining a piece of the climbing stem to which the leaves were attached, it was found that they were alternate, and a portion of the inflorescence showed that the terminal flower in the raceme was hermaphrodite, the stigma being sessile and apparently fimbriate, and the ovary contained one suspended ovule, whilst the lateral flower below it possessed stamens only. Prof. Oliver has recognised the material as identical with a very little known plant described by him some years ago under the name *Piptocalyx moorei*, and provisionally placed by him in the order *Monimiaceæ*, the habit of the plant being that of *Palmeria*, a genus in the same natural order. The botanical description then given in the *Flora Australiensis*, vol. v. p. 292, is reprinted in the present paper.

The author points out that though the plant referred to is probably non-poisonous, the use of this bitter material, of which the physiological properties are unknown, is to be deprecated until its chemical constituents have been examined.

Piptocalyx Moorei. J. C. Umney. (*Ibid.*, 1044.) The author has succeeded in isolating from the leaves of this plant recently described by E. M. Holmes (preceding abstract), a crystallizable, intensely bitter constituent possessing glucosidal properties. The further examination of this substance is being carried on by the author.

Catha Edulis. E. Collin. (*Journ. de Pharm.* [5], xxviii. 337.) The leaves and stems of this Arabian plant, from which Flückiger isolated an alkaloid, katine, the Arabian name of the drug being Kât, Khat, or Cafta, have been further examined by the author, who gives an account of the method of cultivation and of their microscopical structure. He also refers to their physiological and therapeutic properties, and states that the drug has a powerful stimulating action on the nervous system, banishing sleep, restoring the physical forces, and sustaining muscular activity. The leaves are administered in the form of an infusion, tincture and extract.

Constituents of Maté (Ilex Paraguayensis). H. Kunz-Krause. (*Pharm. Journ.*, 3rd series, xxiv. 442.) The author has re-examined this drug, and has satisfied himself of the presence of choline and the absence of ilixanthin (a constituent of *Ilex aquifolium*). The tannin appears to be identical with caffeo-tannic acid, as it gives the same decomposition products.

A summary of the literature of maté will be found in the same paper.

Cheledonium Majus. M. Orlow. (*Amer. Drugg. and Pharm. Record*, June 28th, 1894, from *Apoth. Zeit.*) According to the author, chelidoxanthin is best obtained from the plant by the following method:—

The acidified watery extract is precipitated with picric acid, the precipitate washed with dilute alcohol and then warmed with ammonia. The residue is then dissolved in weak hydrochloric acid and precipitated with strong solution of potassium iodide. The resulting compound is washed with cold water, weak ammonia, and ether successively, and then crystallized from alcohol or hot water. The chelidoxanthin obtained by this process forms a dark-yellow powder or brownish crystal of bitter taste. By heating, it carbonizes, and a fluid distillate is obtained, a portion, however, subliming unchanged. It is easily soluble in alcohol and weak acids, slightly so in water, and insoluble in ether. It contains nitrogen, and behaves in most respects like an alkaloid. It is certainly not a glucoside. With strong sulphuric acid and

vanadic acid it gives a red colour, with potassium bichromate it gives a green, and with molybdic acid no coloration. It occurs in the plant in the proportions of from ·005–·01 per cent., and is most abundant when the plant is in bloom; in early spring the plant contains no chelidoxanthin.

Pycnanthemum Lanceolatum. H. C. Barker. (*Amer. Journ. Pharm.*, February, 1894, 65–71, and April, 1894, 172.) The author has investigated the constituents of this plant, and found it to contain 1·47 per cent. of a yellow volatile oil, resembling that of pennyroyal in odour and having a specific gravity of 0·9361 at 15° C. He could not detect either alkaloids, glucosides, or tannin, but noticed the presence of small quantities of albuminoids, pararabin, mucilage, inulin, and sugar, and mere traces of starch.

Constituents of Pycnanthemum Linifolium. H. C. Barker. (*Amer. Journ. Pharm.*, April, 1894, 169–172.) This plant, like *Pycnanthemum lanceolatum* (preceding abstract), was found to contain neither alkaloids nor glucosides, but it gave a more distinct indication of starch, and contained a much smaller proportion of volatile oil. In other respects the constituents were similar to those found in *P. lanceolatum*.

Mercurialis Annua. G. de Letter. (*Journ. de Pharm. d'Anvers*, 1894, 30.) This plant is found to be a useful laxative, and also to possess diuretic properties. The dose is from 20 to 30 grams of the dried herb in the form of an infusion, or 0·1 to 0·2 gram of an alcoholic extract.

Constituents of Boletus Edulis. E. Winterstein. (*Ber. der deutsch. chem. Ges.*, xxvi. 3098, 3099.) This fungus is found to contain, in addition to trehalose, a new carbohydrate of the formula $C_6H_{10}O_5$, which the author describes under the name *paradextran*.

Native Medicinal Plants from the North Bank of the Gambia. J. H. Ozanne. (*Kew Bulletin*, and *Pharm. Journ.*, 3rd series, xxiv. 858.) The author's report comprises notices of the following:—

Anona senegalensis.
Cochlospermum tinctorium.
Sclerocarya, sp.
Cassia sieberiana.
Combretum, sp.
Sphæranthus hirtus.
Ocimum basilicum.

For particulars the original account should be referred to.

A Kind of Curara acting on the Heart and Muscles. J. Tillie. (*Journ. Anat. and Phys.*, xxvii. 402 and xxviii. 96. From *Pharm. Journ.*) The author has examined an arrow poison used by Indians in New Granada (Colombia), and portions of the plants from which it is said to be prepared. All the botanical specimens are referred to the genus *Strychnos*, but the evidence so far obtained is insufficient for the precise recognition of species. The curara is described as almost black in colour, odourless, brittle, and easily powdered. It dissolves in water, leaving a slight residue, and a 2 per cent. solution is dark red in colour, somewhat bitter, and has a slightly acid reaction. Physiological experiments on frogs showed its action to be a paralysing one upon the endings of the motor nerves. Some poisoned blow-pipe darts from the same district were also examined, and the curara dissolved from their tips was found to produce rapid and absolute paralysis of the muscle of the frog's heart, the respiration continuing; absolute paralysis and rigidity of the skeletal muscles at a much earlier period than happens in the case of an animal whose circulation has been artificially arrested; and exemption of the motor nerves from paralysis until after death and until the muscles show signs of poisoning. In experiments with a rabbit, the absence of motor weakness until near death, the marked action of the poison upon the heart, and the early total paralysis of muscles and onset of rigidity, distinguished the action of the curara from that of the ordinary kind, which does not affect the heart or muscles. It is pointed out, therefore, that this South American curara, though in all probability derived from one or more species of *Strychnos*, resembles in action the strophanthus type of the African arrow poisons. A few particles of it added to a drop of cold strong sulphuric acid produced within a few minutes a dark-red colour, changing to a muddy brown in less than fifteen minutes. When heated with the sulphuric acid to 110-120° F., a tinge of green appeared at the edge of the brownish-red drop, and within forty minutes a very faint olive colour was seen. In view of the fact that curara may consist of curarine-acting or digitalin-acting principles, or of mixtures of these in unknown strength and proportion, it is suggested that it is undesirable, without a careful preliminary examination of each specimen, that crude curara should be employed in place of the alkaloid, curarine, in accurate physiological experiments on the circulation or upon muscle, and especially as a therapeutic agent to be administered by hypodermic injection. It is stated, on the authority of Dr. Whiteford,

that in the district of Antioquia, whence the poisoned darts, etc., were brought, the word "curara" and its variations are used by the Indians in the sense of the generic term "poison," and may be applied to any poisonous substance, whether of vegetable or animal origin. It would seem, therefore, that the arrow poison is not called curara because obtained from the curari plant, "but rather that various plants are called curari, woorali, etc., because they yield curara (*i.e.*, poison)."

Arrow Poisons of the Genus Acokanthera. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xxiv. 41, 42.) The poisons reported upon in this paper are the following:—

1. Wanika arrow poison.
2. Taita, Teita, or Swahili arrow poison.
3. Wa-Kinga, Wa-Kamba, or Murju arrow poison.

As the details cannot be adequately dealt with in the form of an abstract, the reader is referred to the original article.

Malayan Arrow Poisons. R. Stockman. (*Pharm. Journ.*, 3rd series, xxiv. 561.) See also *Year-Book of Pharmacy*, 1893, 142, 143. The poison reported upon is made by the natives of Perak from the root-bark of three trees, the extracts being either mixed or used singly to smear on the arrow-heads. By the natives the poisons are known as "ipoh-aker," "aker lampong," and "prual" respectively. The author has examined the physiological action of alcoholic and watery extracts, made from the bark and wood of the roots of the trees from which the poisons are derived, and finds that these all possess toxic effects.

Ipoh-aker.—This is obtained from a species of *Strychnos*. The extract from the bark kills animals by an action on the heart similar to that of digitalis, leaving the motor nerves excitable to electric stimulation for some time after death. In addition, there is a well-marked curare-like action, combining the effect on the heart with a paralysing influence on the motor nerves, which is much more easily observed in frogs than in rabbits. Extracts made from the wood were very much less toxic than those from the bark, the latter evidently containing more of the cardiac poison, in proportion to the nerve poison, than the wood does. The established existence in curare of two distinct alkaloids, one of which has a digitalis-like action on the heart, while the other paralyses the motor nerves, induces the author to regard it as most probable that ipoh-aker being also derived from a species of *Strychnos*, likewise contains two distinct principles.

Aker lampong. — This also is obtained from a species of

Strychnos, and appears likewise to contain two distinct active principles, acting on the heart and motor nerves respectively. It is very much less toxic, however, and seems to contain such principles in very much smaller proportions.

Prual.—No botanical source of this poison is given by the author. Its action as an arrow poison appears to consist in the immediate local paralysis of the muscles where the animal is struck.

The mixture of the three substances seems excellently adapted for use as an arrow poison, and to differ in its action from any arrow poison from the same district hitherto described.

Note on Malayan Arrow Poisons. W. T. Thiselton Dyer. (*Ibid.*, 582.) Referring to Stockman's paper on this subject (preceding abstract), the author points out that specimens of the plants used in the preparation of these poisons were examined by Stapf, and some light was thrown upon their botanical sources, although the specimens were insufficient for absolute identification.

Lampong was referred conjecturally to *Strychnos Maingayi*. *Ipoh aker* was determined to be a species of *Strychnos* "closely allied to *S. Maingayi*, and probably only a different state of it." *Prual* was a Rubiaceous plant, "possibly a *Lasianthus* or *Urophyllum*."

In connection with this subject the reader is also referred to communications from R. Stockman, E. M. Holmes, and the author, published in *Pharm. Journ.*, pp. 620, 659, and 747.

Hypaphorus Subumbrans. P. C. Plugge. (*Archiv für exp. Pathologie, and Répertoire* [3], v. 507.) *Hypaphorus subumbrans* is a native of Java belonging to the *Papilionaceæ*. The author has isolated from it a colourless, crystalline, dextro-rotatory alkaloid, *hypaphorine*, which fuses at 220° C., is freely soluble in water, and possesses slightly toxic properties.

Homeria Collina. D. McAlpine. (*Pharm. Journ.*, from a Report to the Department of Agriculture, Victoria.) The author directs attention to the poisonous action of a bulbous plant which has been identified as *Homeria collina*, var. *miniata*. It is a native of the Cape of Good Hope, where it is commonly known as "Tulp," or Cape Tulip. It is not, however, a true tulip, but belongs to the *Iridaceæ*, and is sometimes described under the name of *Moræa collina*. It has a very attractive appearance, but is a most dangerous plant to cultivate, as it spreads rapidly by means of its bulbils. These are formed in clusters in the axil of

each of its long grassy leaves, and resemble the head of *Allium vineale* in appearance. A number of cattle died within twenty-four hours after eating the leaves at Pascoe Vale, a suburb of Melbourne, where the plant appears to have become naturalized, and children have occasionally been poisoned by it. It appears to be an irritant poison, causing intense gastritis, extending through the whole course of the small intestines, and causes great venous congestion of the brain. The curious feature in the action of the poison appears to be that the nausea, vomiting, great pain, and prostration of strength are accompanied by constipation. The active principle does not seem to be alkaloidal in character, since no trace of an alkaloid could be detected by the ordinary alkaloidal reagents.

Lathyrus Sylvestris. E. Kinch. (*Journ. Chem. Soc.*, from *Agrl. Students' Gazette*, New Series, vi. 108, 109.) This leguminous plant has been introduced as a cultivated fodder plant suitable for poor soils, under the name of Wagner's flat pea or wood vetchling. The plot of this plant cultivated at the Royal Agricultural College, Cirencester, yielded 30 cwt. of hay per acre on May 30th, 1893, and a second crop on August 4th of the same year. 1,000 parts of the green plants gave 184 parts in an air-dried condition, in which they contained 16·82 per cent. of moisture. The following analyses were made:—

	Green plants.	Perfectly dried plants.
Water	84·70	—
Ash	0·86	5·62
Fibre	4·13	28·97
Ether extract	0·65	4·25
Nitrogenous matter	5·41	35·33
Soluble carbohydrates	3·95	25·83
	100·00	100·00
True proteids	3·51	22·86

It will be seen that the nitrogen content of the dried plants is greater than that of peas or beans, but a much larger proportion (35 per cent.) is of an amide character. It contains twice as much nitrogen as lucerne hay, and about three times as much as meadow hay. The ether extract contained a good deal of chlorophyll.

The Kadamba Tree. (*Pharm. Journ.*, 3rd series, xxiv. 308, from *Indian Agriculturist.*) This tree is indigenous to Ceylon, and is known among botanists as *Anthrocephalus Cadama* (the Kadamba of the Tamils). It has an erect stem with many

branches; the flowers, which have a peculiar sweet smell, forming a small globe. The fruit is about the size of an orange; this is eaten by the poor natives in India, while the leaves are given to cattle as fodder. The bark is considered to be of great value as a febrifuge and tonic; its taste is bitter and astringent. The fresh juice of the bark is applied to the fontanelles of children when that soft portion of the head sinks; at the same time a small quantity mixed with cumin and sugar is given internally. The juice of the bark mixed with an equal quantity of lime juice, opium, and alum has been applied with great benefit round the orbit of the eye to subdue inflammation. The tender leaves, when applied in the form of a paste, resolve glandular swellings, and the large leaves prove an efficacious remedy for eczema. A decoction of the leaves is used as a gargle in cases of apthæ and stomatitis. The fruit is considered to be cooling, a destroyer of phlegm and impurities of the blood. The wood of the Kadamba tree is of great economic importance, is soft, yellow-coloured, and even-grained, weighing about 40 lb. per cubic foot. It is used for building purposes in Assam, and may be used as material for beams and rafters, being also good for joiner's work. In Calcutta it is one-third as cheap as mango wood. Kadamba trees grow wild throughout India, and are principally used for fuel. The closely allied *Manjal-Kadamba*, the *kolon* of the Sinhalese (*Adina Cordifolia*), and Nir-Kadamba or Chelembe, the Helamba of the Sinhalese (*Stephegyne parvifolia*), are sometimes used by carpenters in Ceylon. The wood of the former is extremely fine and like that of the box tree, being light and durable, though it does not stand damp well; it is used in Bombay for planking for the floors of houses.

Constituents of Kousso. M. Leichsenring. (*Archiv der Pharm.*, ccxxxi. 50.) The author arrives at the conclusion that commercial kosin is not a principle pre-existing in kousso flowers, but that it is produced from one of the natural constituents during the process of isolation. He has isolated from the flowers a crystalline, inert substance, "protokosin," and a highly amorphous body for which he proposes the name "kosotoxin." The latter, when boiled with baryta water, yields a crystalline yellow decomposition product, apparently identical with commercial kosin.

Adulteration of Kousso. A. Meyer and H. Sandlund. (*Pharm. Zeit.*, No. 99, 1893.) The authors have observed that kousso sold in the loose state instead of in bundles is frequently adulterated with a notable proportion of unexpanded male flowers.

The sepals of the outer calyx of the latter are distinguished from the corresponding organs of the female flowers by a thick covering of dense, short, unicellular hairs. The presence of pollen also serves to indicate this adulteration.

Standards of Purity of Saffron. J. Barclay. (*Pharm. Journ.*, 3rd series, xxiv. 692, 693.) In a paper under this title the author gives the results of moisture and ash determinations in a large number of samples of saffron, which are tabulated as follows:—

	Moisture per cent.	Ash per cent.	Ash per cent. on dry saffron.
33 Samples.	13·8	4·6	5·33
	11·0	5·5	6·18
	10·2	4·5	5·01
	10·4	5·7	6·36
	10·6	4·9	5·48
	7·9	3·7	4·01
	12·9	6·8	7·80
	15·8	6·4	7·60
	13·8	4·8	5·56
	12·9	5·5	6·31
	14·4	7·2	8·41
	13·5	5·6	6·47
	14·1	5·2	6·05
	13·0	5·4	6·20
	12·7	5·5	6·22
	11·4	5·4	6·09
	12·2	7·0	7·95
	11·6	5·6	6·33
	11·9	6·6	7·49
	12·2	6·3	7·17
	16·3	6·4	7·64
	16·4	6·2	7·41
	14·3	6·4	7·46
	10·9	6·1	6·84
	10·2	4·7	5·23
	11·2	5·0	5·64
	15·0	4·4	5·17
	10·2	4·9	5·45
	11·3	5·4	6·08
	11·3	4·9	5·52
	11·6	5·8	6·56
	13·7	6·1	7·06
	10·6	5·2	5·88
	11·2	4·8	5·40
Mean of all samples	12·37	5·54	6·32

On the strength of these results the following standards are suggested: "100 parts of saffron dried at 202° F. to a constant weight should lose not more than about 12 parts, and should yield on in-

cineration with free access of air an amount of ash corresponding to about 7 per cent. of the dried substance."

Tagetes Glandulifera. O. Hesse. (*Liebig's Annalen*, cclxxvi. 87, 88.) The flowers of this Argentine member of the order *Compositæ* have a local reputation as a stomachic, aperient, diaphoretic and diuretic, and are employed in cases of gastritis and indigestion. They are stated to possess toxic properties necessitating caution in their administration.

The author's examination of this drug does not indicate the presence of any alkaloid. Petroleum ether extracted a substance resembling cerylic acetate, which, after crystallization from alcohol, was found to fuse at 62° C.

Constituents of Kamala. P. Bartolotti. (*Gazz. Chim. Ital.*, xxiv. i. 1–7.) The author states that the so-called "kamaline," occurring in commerce, is simply rottlerin, and gives a further description of the latter, as well as of some of its derivatives. The ash of kamala is shown to contain a large proportion of manganese.

Constituents of Kamala. A. G. Perkin. (*Proc. Chem. Soc.*, No. 127.) A description is given of six distinct substances extracted by ether from Kamala—rottlerin, the principal constituent, described by Anderson, in 1855; isorottlerin; two resins, one of low, the other of high melting-point; a wax, which is possibly cetylic cerotate; and a yellow, crystalline colouring matter present in a minute proportion, the composition of which is yet to be determined.

Rottlerin is best separated from the dye-stuff by means of cold carbon bisulphide, from which it crystallizes in thin salmon-coloured plates melting at 191°; its composition is represented by the empirical formula $C_{11}H_{10}O_3$ already assigned to it by Anderson, but it is undoubtedly a substance of high molecular weight. It yields a diacetyl derivative. On boiling it with alkalies, an odour of benzaldehyde is apparent. When oxidized by cold nitric acid, it yields two acids represented by the formulæ $C_{17}H_{14}O_9$ and $C_{17}H_{16}O_9$, while boiling nitric acid converts it into a dibasic acid of the formula $C_{13}H_{10}O_9$.

Isorottlerin closely resembles rottlerin in appearance, but melts at 198–199°, and is practically insoluble even in hot carbon bisulphide; moreover, no odour of benzaldehyde is apparent when it is boiled with alkali. It yields the acid of the formula $C_{13}H_{10}O_9$ on oxidation.

The resin of low melting-point resembles rottlerin, with which it is evidently closely allied in most of its properties; its compo-

sition is represented by the formula $C_{12}H_{12}O_3$; on oxidation, it yields the acid of the formula $C_{13}H_{10}O_6$.

The resin of high melting-point is a light-yellow coloured substance represented by the formula $C_{13}H_{12}O_4$, and also resembles rottlerin in many of its properties, being converted into the acid of the formula $C_{13}H_{10}O_9$ when boiled with nitric acid.

Goa Powder and Chrysarobin. E. J. Millard. (*Chemist and Druggist*, July 29th, 1893.) Compare also *Year-Book of Pharmacy*, 1893, 159, 160. Since the publication of his previous report on commercial Goa powder, referring exclusively to samples in the form of fine powder, the author has had an opportunity of testing several authentic specimens of the crude drug taken directly from parcels recently imported into Liverpool. The only change that had taken place since they left Bahia was the loss of about 20 per cent. of moisture. The percentages of ash in these were approximately the same, about 7 per cent., and the moisture about 4 per cent.

Crude araroba is roughly divisible into three portions. There is a woody part, consisting of small pieces of wood with much of the powder adhering and filling the interstices. Then there are small, flat, irregular pieces or concretions, which break with a clean fracture and exhibit a pale-brown interior darkening to umber-brown, or even purple towards the exterior. The remainder consists of coarse powder. The relative proportions of these to each other vary considerably, but the powder is always largely in excess.

When separated into the three parts above described, and ignited, the following results were obtained :—

Wood, percentage of ash	1·02
Concretions, „ . .	0·75
Powder, „	8·64

No trace of iron was found in the ash obtained from either wood or concretions.

A considerable quantity of the inorganic material from these samples of crude Goa powder was analysed. The composition was as follows:—

SiO_2	Fe_2O_3	Al_2O_3	K_2SO_4	Na_2SO_4	Total
83·30	7·47	2·90	3·54	2·63	99·84

The above results indicate clearly that the adulteration was not in any way due to excess of woody matter, but to sand and oxide of iron mixed with the powder.

The small amount of ash yielded by the lumps or concretions present in crude Goa powder suggested their further examination. After reducing to fine powder, it was extracted with different solvents, and with the following results:—

	Per cent.
Soluble in benzol	86·5
„ „ alcohol	2·5
„ „ water	·5
„ „ Na O H solution	4·2
Insoluble	6·3
	100·0

The portion soluble in dilute caustic-soda solution gave a deep purple colour to the liquid; the addition of an excess of acid yielded a red precipitate. The amount of chrysarobin yielded by these concretions—86·5 per cent.—is larger than any recorded yield from Goa powder.

As a considerable quantity of chrysarobin extracted during these experiments had accumulated, it was examined by the pharmacopœial and other tests. It was light yellow, minutely crystalline, odourless, and tasteless. It melted at about 154° C., with some decomposition. Although completely soluble in benzol and chloroform, it was not completely soluble in ether.

According to the British Pharmacopœia, chrysarobin should be almost entirely soluble in 150 parts of hot rectified spirit. The author has examined a number of commercial samples, and not one was soluble to a larger extent than about 0·60 per cent. in hot rectified spirit.

The author also finds that the colour reaction with sulphuric acid is never yellow unless the purified chrysarobin of Liebermann and Seidler, obtained by repeated crystallization from glacial acetic acid, is intended by the B.P. Chrysarobin obtained from Goa powder by means of a suitable solvent, such as benzol or chloroform, invariably gives a deep orange to brownish-red colour; the U.S.P. describes it as blood-red. This colour is due to the admixture of purified chrysarobin with chrysophanic acid, the latter giving a red colour with sulphuric acid. When the concentrated acid thus coloured is diluted with water, the orange colour is destroyed, and only a yellow coloration and precipitate remain.

In the German Pharmacopœia (2nd edition, 1884) a test is given, depending upon a violet colour-reaction with nitric acid and solution of ammonia. The author has never succeeded in obtaining this reaction, and points out that in the latest edition (Ph. G., 1890)

the test is omitted, although perpetuated in Thorpe's recently published *Dictionary of Applied Chemistry.*

Constituents of Wormseed (Artemisia Gallica). E. Jahns. (*Ber. der deutsch. chem. Ges.*, xxvi. 1493–1496.) *Artemisia gallica*, Wild., is considered by some botanists to be a variety of *Artemisia maritima*, and was found by Heckel and Schlagdenhauffen to contain, besides santonin and other substances, an alkaloid, the presence of which had not been noticed in other varieties. This subject has now been further investigated by the author, who has succeeded in isolating from wormseed two bases, which on examination proved to be "betaïne" and "choline." They were obtained by the following process:—The powdered drug was extracted with hot water, the solution treated with lead acetate and soda, and subsequently with chloroform; the bases are then precipitated from the aqueous solution with potassium bismuthiodide in presence of sulphuric acid, the precipitate is digested with recently prepared silver carbonate and water, and the compounds are separated by means of absolute alcohol, in which, at ordinary temperatures, choline hydrochloride is readily soluble, whilst betaïne hydrochloride scarcely dissolves.

The bases were identified by their properties and by those of their aurochlorides and platinochlorides.

Jatropha Curcas. A. Siegel. (*Bot. Centralblatt*, xlvii. 120.) The seeds of this plant are found to contain a poisonous principle analogous to ricin, which appears to belong to the toxalbumens. It is described by the author under the name "*curcin.*"

The Castor Bean in India. (*Pharm. Journ.*, 3rd series, xxiv. 426, 427, from United States Consular Reports.) An interesting account is given in this report of the cultivation and collection of castor beans in India, and the processes adopted for obtaining the oil from them. For particulars, reference should be made to the original. Various uses of the oil are mentioned in addition to its application for therapeutic purposes. It is much employed in India for burning in lamps, as it gives a light surpassing in brilliancy that obtained by means of any other vegetable or mineral oil, and possesses the further advantage of great safety and freedom from smoke in burning. It is also largely used as a lubricant for machinery; as a dressing for hides and skins it enjoys an excellent reputation, and the Indian dyers also make frequent use of it. The press cake forms a useful manure, and is a very good material for making illuminating gas. In Assam the leaves of the plant furnish food for the silkworm, and good paper pulp can be made from its bark.

Agrostemma Githago. T. F. Hanausek. (*Chem. Zeitung*, xvi., No. 71.) Authorities are not agreed as to the poisonous properties of corncockle seeds (*Agrostemma githago*). Recently, C. Kornauth and A. Arche have proved that pigs may be fattened on these seeds, which have for them the same nutritive value as barley. Other observers consider the seeds injurious, and maintain that where no harm occurs, it is because the saponins are in great part decomposed by the digestive juices. The author's results show that the seeds certainly do contain saponins, but that they are confined to the embryo.

Constituents of the Fruit of Gymnocladus Canadensis. W. E. Stone and W. H. Test. (*Amer. Chem. Journ.*, xv. 660–663.) See also *Year-Book of Pharmacy*, 1893, 139. The fruit consists of a leathery pod from 3 to 10 in. in length, and contains from two to six brown, oval, and very hard seeds embedded in a greenish, waxy pulp or gum. This gum has a sweet but very disagreeable taste, and at the time of ripening is soft and easily removed, although later it becomes horny. It contains no galactose, galactan, or starch, but an abundance of soluble reducing sugars and pentosans.

The alcoholic extract yielded cane-sugar (15 per cent.), $[\alpha]_D = 65{\cdot}4°$, and glucose (15 per cent.).

The gummy residue, on hydrolysis with dilute sulphuric acid, yielded an insoluble substance resembling cellulose, and a thick, reducing syrup which gave the furfuraldehyde reaction for pentoses. The osazone melted at 175–180°, indicating a mixture. This was separated by means of alcohol and water into two fractions: the first proved to be glucosazone (m. p. 204–205°), soluble in alcohol but insoluble in boiling water; the second (m. p. 153°) was probably arabinosazone (m. p. 158–160°), insoluble in alcohol but soluble in boiling water. The latter gave an abundance of furfuraldehyde when boiled with strong hydrochloric acid, and its alcoholic solution was optically inactive, so that it was not xylosazone. The glucose and arabinose probably exist in the original gum in combination as *glucoaraban*.

Analysis of the Seeds of Sanguinaria Canadensis. J. Culley. (*Amer. Journ. Pharm.*, April, 1894, 189–192.) The seeds of this plant were found by the author to contain, in addition to the usual plant constituents, an alkaloid agreeing in its characters with sanguinarine, a large proportion of fixed oil, and small quantities of resin, glucose, pectin, pararabin, calcium oxalate, etc.

Lupinus Albus. A. Soldaini. (*L'Orosi*, xvi. 109–126.) In

this paper the author supplies some further particulars respecting the deliquescent alkaloid previously obtained by him from the seeds of this plant. For details, reference should be made to the original account.

American Colocynth. L. E. Sayre. (*Amer. Journ. Pharm.*, 1894, 273–278.) The results of the author's proximate analysis of the American colocynth in comparison with those obtained in the analysis of the imported drug are embodied in the following table. The figures mentioned are percentages obtained from the powdered drugs dried in an oven:—

	Extracts and constituents.	Imported.	American.
I.	Ether-chloroform extract	3·21	4·62
	(a) Fat. (Petroleum-ether extract from I.)	1·11	·521
	(b) Resin from I., soluble in alcohol and precipitated by water.	·64	·48
II.	Alcoholic extract (of dregs from I.)	16·61	28·23
	Principles acting as reducing sugar in II.	2·15	10·31
III.	Aqueous extract.	31·07	24·69
	Gum (precipitated from III.)	9·36	12·61
IV.	Amyloid principles (in dregs of III.)	2·07	2·34
V.	Cellulose.	13·5	14·76
VI.	Albuminous (protein) compounds	14·31	14·69
VII.	Ash	9·76	6·01
VIII.	Moisture (in air-dry powder)	6·8	7·9
	Diluted alcoholic (official) extract	32·68	38·87

The aqueous extract (III.) was scarcely bitter, most all of the bitter principles being extracted by the solvents I. and II. The author regrets that the quantity of powder left after the above treatment was not sufficient to enable him to isolate the bitter principle, colocynthin. This he intends to do after receiving fresh supplies.

A full description of the fruit and of transverse and longitudinal sections, illustrated by woodcuts, will be found in the original account.

Note on Lemon and Orange Peel. E. G. Clayton. (*Analyst*, xix. 134.) The author states that when orange peel is moistened with strong hydrochloric acid, its colour changes from yellow to a rich, dark green; lemon peel, similarly treated, retains its hue, or, at most, assumes a dingy, yellowish-brown tint. A convenient and simple chemical test, therefore, which will distinguish between small fragments of lemon and orange peel, is to touch them with a glass rod previously dipped in hydrochloric acid. A few minutes' exposure to hydrochloric acid gas will effect this change in the

colour of orange peel. The colour of lemon peel is unaffected. The peel of the lime behaves, with hydrochloric acid, like lemon peel.

Indian Water Chestnut. Trapa Bispinosa. D. Hooper. (*Pharm. Journ.*, 3rd series, xxiv. 22, 23.) The Trapas are water plants growing in canals and shallow lakes in Eastern countries, and belonging to the natural order *Onagraceæ*. *Trapa natans* is the European species yielding the "Jesuits' nut" of Venice. *T. bicornis* is the Chinese species, and affords the "ling" of that country, which is largely used as an article of diet. *T. bispinosa* belongs to Northern India, and is extensively cultivated in Guzerat, Kashmir, and the North-Western Provinces. The vernacular names of the Indian water chestnut are *Singhara*, *Paniphul*, *Cingada*, and *Karimpola*. The Trapas have long been known in medical history.

The author has examined some of the fruits recently collected by him in Mussoorie. The outer red-brown coats were removed, and the white kernels were sliced and dried in the sun. The powdered nuts had a white colour, a slightly sour odour, and no distinct taste. The starch, observed under a microscope, consisted of oval, oval-oblong, and elliptic granules; there had been no pressure to form angular outlines.

An analysis of the powdered kernels showed the following composition:—

Fat	·97
Sugar and gum	14·36
Albuminous matter	8·41
Starch	63·84
Cellulose	3·60
Ash	4·66
Water	4·16
	100·00
Nitrogen	1·33

The nutrient-ratio, or the ratio between the albuminous matter and the starchy materials, is 1 : 9·5, and the nutrient-value 80·4. This result shows that the Indian water chestnut is allied to the cereals as a food, and is a little better than cleaned rice, which has a nutrient-ratio of 1 : 10·8. The Trapas have been noted for their power of taking up manganese; thus Gorup-Besanez found 1·61 per cent. of manganese oxide in the whole plant of *Trapa natans*. The Indian species examined by the author was found to

contain manganese both in the pericarp and kernel. The 4·66 per cent. of ash in the edible portion contained only a very small quantity of this metal, but the pericarp yielded a reddish-coloured ash which was very rich in manganese.

Ash and Moisture in Drugs. E. Dieterich. (*Chemist and Druggist*, October 14th, 1893.) The author gives the following figures for commercial powdered drugs, which have been determined in his own laboratories:—

Powder of	Per cent. water.	Per cent. ash.	K_2CO_3 in 100 ash.
Cantharidis	12·45	6·55	—
,,	7·30	10·55	—
,,	8·85	8·20	—
,, (Chinese)	11·40	4·00	—
Fol. senn. Alexandr.	7·55	9·20	—
,, ,, ,,	9·70	14·70	21·12
,, ,, ,,	14·15	15·75	5·47
,, ,, ,,	8·05	15·25	11·65
,, ,, Tinnevelly	14·50	9·70	10·66
,, ,, ,,	7·75	10·80	22·36
,, ,, ,,	7·85	11·30	12·52
Herb. conii	7·15	18·60	29·62
Fol. digitalis	11·05	12·85	16·78
,, ,,	6·40	11·25	39·86
Rad. iridis	12·05	4·55	34·07
,, glycyrrhizæ	6·75	5·60	a trace
,, ,,	13·50	4·80	14·59
,, ,,	5·75	5·30	11·30
,, rhei	12·00	8·30	16·90
,, ,,	5·60	8·40	31·80
,, ,,	5·05	8·20	28·19

The Tanno-Resinous Exudation from Spermolepis Gummifera. E. Heckel and F. Schlagdenhauffen. (*Répertoire de Pharm.* [3], v. 289.) Compare *Year-Book of Pharmacy*, 1893, 162. A further examination of this exudation shows the presence of the following constituents:—

	Per cent.
Gallo-tannic acid	79·73
Tanno-resin, insoluble in boiling water	19·5
Gum, colouring and albuminoid matter, and fixed salts	0·47
A crystalline substance resembling catechin	0·3

The crystalline constituent is not identical with catechin, and occurs also in the wood of the tree, but not in the bark. The tanno-resin only occurs in the exudation, but the gallo-tannic

acid is also found in the wood and bark. The authors suggest that the tree should henceforth be called *Spermolepis tannifera*, since this name would be more in accord with the facts established by their investigation.

Xanthorrhœa Resins. M. Bamberger. (*Monatshefte*, xiv. 333–343.) Yellow Xanthorrhœa resin (*X. hastilis*) was extracted with boiling 95 per cent. alcohol, the residue repeatedly boiled with water, and finally dissolved in dilute potash and acidified with dilute sulphuric acid. The crystalline material obtained from these various extracts by means of ether was then treated with chloroform, in which it partially dissolved. The portion insoluble in chloroform, on purification, proved to be paracoumaric acid, $C_9H_8O_3 + H_2O$, about 10 per cent. of the weight of the resin being obtained. The portion of the extract which was soluble in chloroform contained parahydroxybenzaldehyde, benzoic acid, and cinnamic acid. A small quantity of a substance, which was probably vanillin, was also isolated, as well as a small quantity of a white neutral substance, the nature of which was not further examined. Red Xanthorrhœa resin (*X. australis*), when treated in the same manner, yielded about 2 per cent. of paracoumaric acid, together with parahydroxybenzaldehyde and a substance resembling vanillin. Cinnamic and benzoic acids were not detected in this resin.

Mecca Balsam and Myrrh. G. Schweinfurth. (*Amer. Drugg. and Pharm. Rec.*, from a report of the Berlin Pharm. Soc.) The south-western districts of Arabia and the north-eastern corner of Africa are characterized by the production of trees yielding aromatic exudations. The author observes that, although the shrub yielding Mecca balsam, *Commiphora opobalsamum*, Engl., is widely distributed over the coast territory of Arabia, the adjacent islands, and Southern Nubia, the balsam is collected only in the valleys near Mecca; the plants producing olibanum and myrrh prefer low mountains, 3,000 to 5,000 feet high, and rocky soil. *C. opobalsamum* averages about 15 feet in height, possesses a yellow exfoliating bark, and produces long, thin, greyish black twigs, from the ends of which a small quantity of balsam exudes. Although not an eye-witness of its collection, the author thinks the balsam must be obtained by crushing and boiling the ends of the twigs, or by pouring boiling water over them. Collection by exudation is out of the question, as only a few centimetres towards the ends of the twigs contain much sap, appear varnish-like, and yield, when incised, minute

drops of bright green fluid possessing the characteristic odour of Mecca balsam.

Myrrh, according to the author, can be yielded only by *C. abyssinica* or *C. Schimperi*, and is probably obtained principally from the former, which is widely distributed, and in certain districts abundant. A. Deflers actually collected myrrh from this plant, which was pointed out to him in the Fadhli district east of Aden as the source of the myrrh brought thence in large quantities into commerce, and a specimen of this myrrh was presented by the author to the Pharmaceutical Society of Berlin. The tree is a small one, seldom exceeding 30 feet in height, with a yellow or brown shining exfoliating bark. When incised, the bark yields abundance of yellowish milky fluid, which solidifies to myrrh. The plant also occurs in Northern Abyssinia, but not in such abundance as to offer sufficient inducement to collect the gum-resin; the drug comes probably from the northern districts of Yemen and the mountains of Assir. *Balsamodendron myrrha* (*Hemprichia myrrha*, Nees, Schwf.) yields no myrrh; the plant is completely odourless, and yields no trace of resin when branch or stem is incised. Hemprich noted on his specimen that possibly this species yielded myrrh, but the evidence to that effect was insufficient. Nees v. Esenbeck described the plant, however, as the source of Arabian myrrh, hence the error. *C. Schimperi* grows in Yemen, and produces abundance of gum-resin closely resembling myrrh. It is also found in Abyssinia, where, however, little or no myrrh is collected from it.

Siam Benzoin. F. Lüdy. (*Archiv der Pharm.*, ccxxxi. 461–480.) Siam benzoin is soluble in ether, and the dissolved substance yields no ash when ignited. It contains 0·15 per cent. of vanillin; some free benzoic acid; 0·3 per cent. of an oily, neutral substance which is an ethereal salt of benzoic acid; and a mixture of a small quantity of *benzoresinylic benzoate* with much *siaresinotannylic benzoate*, this mixture forming the main constituent of the drug. In addition to these, woody impurities are present to the extent of 1·6–3·3 per cent. No cinnamic acid, either free or combined, could be detected. By hydrolysis of the mixture of benzoresinylic and siaresinotannylic benzoates, benzoic acid and a mixture of benzoresinol and siaresinotannol are obtained in the proportion of about 1:11. The benzoresinol is identical with the substance obtained from Sumatra benzoin; it crystallizes from acetone in groups of long, white prisms, and melts at 272°. *Siaresinotannol*, $C_{12}H_{14}O_3$, is a brown powder, re-

sembling in its properties the resinotannol obtained from Sumatra benzoin.

Galbanum. A. Conrady. (*Archiv der Pharm.*, ccxxxii. 98.) In addition to ·25 per cent. of free umbelliferone, the resin of galbanum is shown to contain a large percentage of this principle in combination with a resin alcohol. The ether compound alluded to can be decomposed by means of moderately diluted sulphuric acid, and saponified by caustic alkalies. The latter treatment causes a conversion of the umbelliferone into umbellic acid, which is the cause of the green coloration produced on boiling galbanum with caustic potash and chloroform.

The violet coloration produced when galbanum is treated with hot alcohol and hydrochloric acid has nothing to do with the body just referred to, but is a reaction of the volatile oil.

Galbanum. E. Hirschsohn. (*Pharm. Zeitschr. für Russland*, 1893, 353.) Galbanum as it now occurs in commerce is stated by the author to differ in some respects from the drug of former times; it is softer in consistence, resembles the so-called Levant galbanum in its odour, and is differently acted upon by solvents. On treatment with strong acids, the gum resin or its alcoholic solutions yield yellowish or brownish colorations instead of the violet one referred to in some of the Pharmacopœias. Petroleum-ether extracts from 23·50–30·50 per cent. of resin and volatile oil, of which the former amounts to 3·5 to 4·5 per cent., whereas in previous investigations only 0·5 to 1·0 per cent. of resin was obtained in this manner. This resin is soluble in sodium hydrate, and upon the addition of acid a substance called *galbanic acid* separates, which subsequently becomes crystalline. The presence of this large percentage of resin rather interferes with the test for the oleo-resin of turpentine. The petroleum-ether solution agitated with an aqueous solution of cupric acetate produces only a pale green colour in the case of pure galbanum, while in the presence of 10 per cent. of turpentine the green coloration imparted to the petroleum ether is very intense.

Soluble Gums. P. Palladino. (*Journ. Chem. Soc.*, from *Bull. de la Soc. Chim.* [3], ix. 578–580.) The author points out that natural soluble gums never contain starch. An adulteration with dextrin is difficult to recognise, but if an alkaline solution of a gum is boiled for a minute with aniline sulphate, chlorobrucine, pure brucine, orcinol, or orceïn, the liquid remains pale yellow with a greenish tinge in the absence of dextrin, but becomes orange-yellow or brownish-red if the latter is present. Other

results are given in the following table, in which (1) represents the sp. gr. at 15° of solutions containing 13·024 grams of the gum in 100 c.c.; (2) is the viscosity of the same solution as compared with water; (3) is the acidity in terms of arabic acid; (4) is the specific rotation, $[\alpha]_D$, at 16°.

	1.	2.	3.	4.
Kordofan	1·0450	1·4166	6·29	−26·47
Galam	1·0448	1·3333	7·23	+ 2·11
Salabreda	1·0448	1·4166	8·18	+14·57
Bas du Fleuve	1·0450	1·5000	6·92	−28·47
Arabic (Kordofan)	1·0454	1·3333	6·92	−23·02
Zula	1·0448	1·1666	7·23	+12·84
Gheziri	1·0446	1·3333	9·75	+45·01
Amrad	1·0425	1·3333	5·03	+71·81
Australia	1·0488	1·1666	5·03	+62·21
Cape	1·0395	1·5000	7·86	+33·09
Suakim	1·0450	1·3333	10·06	−21·17
Turique	1·0450	1·5833	9·12	+34·41
Geddah	1·0449	1·4166	5·34	−24·87

The rotatory powers of solutions of different parts of the same fragment of gum are different. There is no constant relation between the rotatory power of the gum solution and the quantity of gummic acid obtainable from it; neither is there any relation between the rotatory power of the gum and that of the sugars obtained from it by the action of acids.

Optical Examination of Gums. M. Guichard. (*Chemist and Druggist*, July 29th, 1893.) The author has examined the rotatory powers of the various acacia gums in the market, and finds that they form three series: those of Galam, Mogador, and Australia have a rotatory power near + 16°; Arabic, Aden, and Amrad gums border upon + 32°, whilst gum Ghatti has a rotatory power close upon + 64°. The differences may be explained by the view that the gums are mixtures of several dextro-rotatory and lævo-rotatory substances.

An East African Gum resembling Tragacanth. C. Hartwich. (*Archiv der Pharm.*, ccxxxi. 43.) The author describes an East African gum supposed to be produced by a species of *Sterculia*. It contains a small proportion of flattened pieces of the characteristic shape of tragacanth, but consists for the most part of whitish, rounded or pear-shaped masses. It appears to consist chiefly of bassorin, and is slowly acted upon by cold water, of which it converts 200 times its own weight into a jelly-like mucilage. On prolonged boiling with water, however, it becomes soluble.

Copaifera Salikounda. E. Heckel and F. Schlagdenhauffen. (*Annales de la Faculté des Sciences de Marseille.* From *Pharm. Journ.*) In 1890 some black beans were received from M. R. P. Raimbault, a missionary at Konakry in French Guinea. These were stated to be used by the Susus (a tribe of negroes found between 9° and 11° N. lat., on the West Coast of Africa), under the name of "Salikounda." They have a distinct odour of coumarin. Believing that they might be of commercial interest, a supply for the purpose of chemical analysis was obtained from Sherboro' Island, where the tree appears to be plentiful. From the Rio Pongo Mission, fruits and leaves were received from which it was possible to refer the seeds to the genus *Copaifera*; but it was not until July, 1893, that specimens of the flowers were obtained, through Dr. Drevon, of Konakry.

The material thus obtained showed that the tree was more nearly allied to the Central American species than to the known African species, the latter having trifoliate leaves, whereas the Salikounda tree has paripinnate leaves, with three to five pairs of opposite leaflets. The leaflets are oval, entire, $4\frac{1}{2}$ centimetres long by 2 broad, emarginate and somewhat unequal at the base, feather-veined, the veins being slightly velvety, and are without resin cells. The inflorescence is panicled and axillary. The flowers are small and yellowish-green, nearly sessile, and about 3–4 millimetres in diameter. The flower has three velvety caducous bracts, of which one is oval and larger than the other two. There are four sepals, which are imbricate, velvety, and unequal in size, the largest being about 4 mm. by 3 mm. There are ten stamens having filiform filaments inserted on a glandular ten-lobed disc. The ovary is hairy, one-celled, compressed, and contains two anatropous ovules. The style is 3 mm. long, filiform, and curved, and the stigma is capitate. The tree is 10–15 metres high, and flowers in October. The fruits are produced in April. The pod is 3 centimetres long by $2\frac{1}{2}$ broad, oval, compressed, gibbous, terminated by a sharp point, and of a chestnut colour. The inner surface is smooth, polished, and of a greenish-white colour. It contains usually only one seed, covered with a fine scarlet arillus, and attached by a slender orange filament.

This species is very near the American *C. Langsdorffii*, from which it differs in the nervation of the leaves, which are less rich in anastomosing veinlets, in the absence of secreting cells in the leaves and stem, in the larger size of the flowers and their less hairy character, and in the more readily caducous bracts. It thus

forms an interesting connecting link between the American and African species. The tree is found abundantly also in the Callisocco country, especially around Cape Verga and in Haut-Forécaréah.

The seed, when dry, has a distinct odour of coumarin. All parts of the tree, except the leaves, have the same odour, according to Dr. Drevon; a hard resinous exudation found on the trunk also smells of coumarin. The arillus of the seed has not the same perfume, and is generally removed in the samples sent to Europe.

In Sherboro' Island the seeds are used by the natives to form a fragrant pomade. In the Rio Pongo district the women break the seeds into pieces, with which they make necklaces. In medicine it is employed to relieve vertigo and giddiness; for this purpose a cold infusion of the seed is taken. It also serves to perfume snuff.

A chemical examination of the beans showed that the seed without the integuments contained 0·80 per cent. of coumarin, and the seed coats only ·027 per cent. The seeds contained also 4·12 per cent. of oil, together with starch, sugar, albumen, and colouring matter, traces of tannin, whilst in the seed coat the ash contained much manganese.

On a comparison being made with Tonka beans, the seeds of the latter deprived of their coats yielded 1·233 per cent. of coumarin and 37·933 per cent. of oil, and the integuments 3·158 per cent. of coumarin and ·004 per cent. of oil. The seeds also contain manganese. It thus appears that the integument of the Salikounda seed is not quite so rich in coumarin as the seed itself, whilst in the Tonka bean the seed coats contain more than twice as much as the seed itself, and the Tonka bean contains 17–18 times as much coumarin as the Salikounda bean.

African Copaiba. J. C. Umney. In a letter to the *Pharmaceutical Journal* (January 13th, 1894) the author refers to the recent report by Heckel and Schlagdenhauffen on the "Salikounda Bean" (see preceding abstract), as affording evidence of the existence of a further African species of the genus *Copaifera*. He points out that the African copaiba described by him a short time ago (see *Year-Book of Pharmacy*, 1892, 168, and 1893, 421) does not appear to be the product of the same *Copaifera* (*C. salikounda*), as the oleo-resin possesses no trace of the odour of coumarin, and as the resinous exudation does not become spontaneously hard.

Detection of Gurjun Oil as an Adulterant in Copaiba. E. Hirschsohn. (*Pharm. Zeitschr. für Russland*, 1893, No. 43;

Apothcker Zeitung, 1893, 565.) If a few drops of pure copaiba are added to one or two c.c. of a solution of 1 gram of pure strong sulphuric acid in 25 grams of pure acetic ether, a yellow or pale brownish yellow coloration is produced, while in the presence of an appreciable proportion of gurjun oil the coloration is red, and gradually changes to reddish violet. Another mode of testing is as follows:—One volume of the balsam is agitated several times at the ordinary temperature with 3–4 volumes of water, filtered through a wet filter, and the filtrate mixed with an equal volume of hydrochloric acid of 1·12 specific gravity. In the case of pure copaiba no coloration whatever is thus produced, whereas in the presence of gurjun oil a red colour is developed within a few minutes.

Gutta-Percha. O. Oesterlé. (*Archiv der Pharm.*, 230, 641. From *Pharm. Journ.*) Gutta-percha (getah-pertcha) is a collective name applying to the product obtained by the induration of the milk sap of several different trees, of which the one formerly best known, *Isonandra Gutta*, or *Palaquium Gutta*, has now almost disappeared, owing to the felling of the trees to obtain the juice, and their consequent destruction. According to Burck, several other species of *Palaquium* were employed in 1884 as sources of gutta-percha, notably *P. Borneense*, *P. Trenbii*, and *P. Leerii*. A somewhat similar juice is also yielded by other members of the sapotaceous family, but the products thus obtained from *Sideroxylon*, *Chrysophyllum*, and *Mimusops* are of little or no industrial value. The author has examined gutta-percha obtained from *P. Leerii*, and found it practically identical with the ordinary commercial article; it consisted of *gutta*, $(C_{10}H_{16})_n$; *alban*, $C_{14}H_{64}O_2$; and *fluavil*, $(C_{10}H_{16}O)_n$, the latter being present in larger quantity in some specimens than in others, and producing a corresponding deteriorating effect on the physical qualities of the mass; whereas an increased proportion of alban seems to be without this effect.

Resin of Sumbul. P. H. Utech. (*Amer. Journ. Pharm.*, 1893, 465, 466.) This resin was obtained from coarsely powdered sumbul root by macerating the latter successively with water and solution of sodium carbonate, then washing with cold water, allowing to dry, and now extracting the resin from the dry residue by percolation with alcohol. After recovering the alcohol by distillation, pouring the residue into water, and drying the precipitated resin in an air-bath at 110° C., 6·1 per cent. of a clear, transparent, amber-coloured product was obtained, which had a bitter taste and

the aromatic odour of the root. It was completely soluble in chloroform, ether, carbon disulphide, acetone, benzol, and acetic ether, but only partly dissolved by petroleum ether and acetic acid. It was almost insoluble in solution of ammonia. 4 grams of the resin when completely incinerated left 50 milligrams of ash.

The resin was partly soluble in hydrochloric acid with a violet-blue colour, soon changing to brown. Sulphuric acid completely dissolved it with the production of a thick blackish liquid, and on adding the solution to water, the resin was reprecipitated. Nitric acid imparted a dark-red colour to the resin without acquiring any appreciable coloration itself.

On adding 1 c.c. of fuming nitric acid to 1 gram of the resin, a rapid oxidation occurred, attended with copious evolution of nitrous fumes, and left as a product of the oxidation a brown, waxy substance which was readily soluble in alcohol. This alcoholic solution, when added to water and filtered, gave a lemon-yellow solution, which in its general behaviour towards reagents corresponded to picric acid.

The resin was but slightly soluble in solutions of potassium or sodium hydrate. An alcoholic solution of the resin was not affected by ferric chloride.

When fused with potassium hydrate, a brownish mass was formed, a portion of which was soluble in water, and the insoluble portion dissolved in glycerin on warming. On acidulating the aqueous solution with diluted sulphuric acid, agitating with ether, decanting the ethereal layer, and allowing the same to evaporate spontaneously, the residue, when dissolved in water, gave a clear colourless liquid, which decolorized an acid solution of potassium permanganate. It was further tested with solutions of ferric chloride, ferrous sulphate, and silver nitrate, but its identity with the di-acid phenols could not be established.

Quality of some Trade Samples of Podophyllin Resin. E. D. Gravill and C. E. Sage. (*Pharm. Journ.*, 3rd series, xxiv. 421.) The authors have examined a number of trade specimens of this resin, with results leading to the following conclusions:—

Trade samples of so-called podophyllin resin exist which are largely adulterated, and the nature of the adulteration appears to be powdered podophyllum rhizome and earthy matters.

The colour of the resin is not a very material characteristic of its genuineness.

Samples yielding more than a trace of matter insoluble in rectified spirit, and much more than 0·50 per cent. of inorganic matter,

on incineration, may be considered to be to a greater or less extent adulterated.

Constituents of Balsam of Peru. H. Trog. (*Archiv der Pharm.*, ccxxxii. 71, and *Pharm. Journ.*) The author has examined balsam of Peru, and found that the fluid portion of the balsam consists almost entirely of benzyl benzoate, only a very small proportion of benzyl cinnamate being present. Neither phenyl-propyl cinnamate, styracin, free benzyl, alcohol, or benzoic acid could be detected; on the other hand, free cinnamic acid and vanillin were present. The resin proved to be an ester. By saponification it yielded cinnamic with a little benzoic acid and a resin alcohol, peru-resino-tannol, probably derived from a tannin. The bark of the tree contained minute quantities of phloroglucin, tannin, phlobaphene, wax, and non-saponifiable resin. In very young twigs resin ducts were found, but these were soon thrown off in the growth of the plant, and no others formed. Balsam of Peru is, therefore, like benzoin, a pathological product.

Borneo Gambier. (*Kew Bulletin*, lxxviii. 139.) A successful attempt has been made to cultivate gambier in British North Borneo. The first sample received in a somewhat damp condition was found to contain close upon 20 per cent. of tannin, while a dried sample indicated as much as 27·8 per cent. The quality of the product is regarded as not inferior to Singapore gambier, and it is therefore intended to extend the cultivation.

Collection of Manna in Sicily. J. S. Ward. (*Pharm. Journ.*, 3rd series, xxiv. 381.) The author gives a brief account of the mode of collection of this drug near Palermo, which shows that the present procedure differs but little from that of former days as described in standard works. For particulars, reference should be made to the original paper.

The Assay of Opium. D. B. Dott. (*Pharm. Journ.*, 3rd series, xxiv. 847, 848.) The author recommends the following process as possessing distinct advantages over those generally employed:— 10 grams of powdered opium are digested with 25 c.c. of water; 1·8 gram of barium chloride dissolved in about 12 c.c. of water is then added, the solution made up to 50 c.c., well mixed, and after a short time filtered. 22 c.c. (representing 5 grams of opium) are mixed with dilute sulphuric acid in just sufficient quantity to precipitate the barium. About 1 c.c. is required, and the solution should be warmed to cause the precipitate to subside and the solution to filter clear. To this filtered solution a little dilute ammonia, about 0·5 c.c., should be added to neutralize the free acid,

and the solution concentrated to 6 or 7 c.c., and allowed to cool. 1 c.c. of spirit and 1 c.c. of ether are then added, and next ammonia in slight excess. The ammonia should be added gradually until there is no further precipitation, and a perceptible odour of ammonia remains after well stirring and breaking down any lumps with the stirring rod. After three hours the precipitate is collected on counterpoised filters and washed. Before filtering, it should be noted that the solution has a faint odour of ammonia; if not, one or two drops of ammonia solution should be added. The dried precipitate is washed with benzene or chloroform, dried and weighed. It is then titrated with $n/10$ acid, until the morphine is neutralized, as indicated by the solution reddening litmus paper. 1 c.c. $n/10$ acid = ·0303 gram of morphine hydrate.

Macassar Oil. R. Glenk. (*Amer. Journ. Pharm.*, lxv. 528.) A specimen of this oil, obtained from the seeds of *Schleichera trijuga* (*Sapindaceæ*), and sent from Mirzapoor, Hindostan, has been examined by the author, and is described by him as a yellowish-white semi-solid substance, having a faint odour of bitter almonds, a slightly rancid taste, an acid reaction, and a specific gravity of 0·942. The oil completely liquefied at 28° C., congealing again at 10°. It was readily saponified by sodium hydrate, even at a low temperature, forming a white, hard soap. With nitrous acid it assumed an orange-red colour, and became viscid, but did not appear to solidify. Concentrated sulphuric acid acquired a reddish-brown colour on addition of the oil. Chloroform, ether, carbon bisulphide, benzol, benzin, and the fixed and volatile oils freely dissolved the oil, but alcohol exercised only a slight solvent effect.

Expressed Oil of Mace. A. Hilger. (*Chemist and Druggist*, October 14th, 1893.) The author has shown that the fat of Bombay mace prepared by the precipitation method contains no myristic acid. The yellow constituent, which is readily soluble in alcohol, is only after considerable trouble obtained free from adherent fat and dextrose, and is found to have the characteristics of a quinone. It readily reduces silver nitrate solution, and this reaction is stated to be so characteristic that Bombay mace can be readily identified by it as such.

Essential Oil of Nutmeg. J. C. Umney. (*Pharm. Journ.*, 3rd series, xxiv. 935.) The results of recent experiments on nutmeg oils, both of English and foreign distillation, induce the author to suggest that if it should be deemed desirable in future editions of the B.P. to include oils of nutmeg other than those distilled in Britain, tests should be added such as those of the United States

Pharmacopœia, viz., that the oil should be soluble in an equal volume of alcohol, sp. gr. ·920, whilst possibly a slightly wider margin of specific gravity, viz., from ·870 to ·910 instead of ·900 as there allowed, might be advantageously included. The following table shows a comparison of four samples examined by him:—

	1. Foreign.	2. Foreign.	3. Foreign.	4. English.
Spec. grav. at 15° C.	·955	·884	·886	·907
Solubility in alcohol, spec. grav. ·820	Not entirely soluble in any proportion.	Soluble in equal volume.	Soluble in equal volume.	Soluble in equal volume.
Fractionation—				
Below 180° C.	0·54 p.c.	61·9	63·1	60·5
180–200° C.	2·5 „	18·4	19·1	10·8
200–260° C.	58·1 „	14·2	13·9	7·2
260–290° C.	27·1 „	1·3	—	7·7
Residue by difference	11·7 „	4·1	3·9	13·8

Recent Work on Essential Oils. Schimmel & Co. (Authors' report for October, 1893; also *Pharm Journ.*, 3rd series, xxiv. 504–506.) The following oils are reported on:—

Caraway Oil.
Bitter Almond Oil, Artificial.
Citronella Oil.
Bergamot Oil.
Eucalyptus Oil.
Fennel Oil.
Ginger Oil.
Lavender Oil.
Rose Oil, Bulgarian.
Thuga Oil.
Wintergreen Oil.
Mignonette Oils.

For particulars, reference should be made to the sources quoted, as the report does not admit of useful condensation.

Essential Oil of Male-Fern (Aspidium Filix Mas). A. Ehrenberg. (*Archiv der Pharm.*, 1893, 345, 356.) Compare also *Year-Book of Pharmacy*, 1893, 131. The following yields of essential oil were obtained from air-dried rhizomes collected at different periods:—

	Per cent.
April	0·008
June	0·025
September, October, and November .	0·04–0·045

The oil appears to consist of free fatty acids, of which butyric acid is the most predominating; of a number of esters of hexyl and octyl alcohol, with the fatty acids commencing with butric acid and including pelargonic acid; and of small quantities of aromatic bodies. Its physiological activity has been confirmed by R. Kobert. The statement of the latter that the oleo-resin of *Aspidium filix mas* becomes inferior in its anthelmintic action when it is deprived of the essential oil is found to be true also with regard to the oleo-resin of *Aspidium athamanticum*.

Essential Oil of the Seeds of Cicuta Virosa. J. Trapp (*Archiv der Pharm.*, ccxxxi. 212, 213.) The oil obtained by distillation from the dried seeds of this plant resembles cumin oil in odour and taste, and consists chiefly of cymene and cuminaldehyde.

Essential Oil of Valerian. M. Oliviero. (*Comptes Rendus*, cxvii. 1096, 1097.) The author has examined the fraction of this oil boiling at 157° C., which he finds to consist partly of a terebenthene, and partly of a lævorotatory camphene ($[\alpha]_D = -21°$).

Purity of Oil of Sandal-wood. (From *Pharm. Journ.*) Referring to Cripps' proposed test for the purity of this oil (see *Year-Book of Pharmacy*, 1893, 77), Schimmel & Co. state that they find it may be rendered somewhat more stringent by using alcohol of 70 instead of 75 per cent., at a temperature of about 20° instead of 15·5°, but in the same proportion, viz., 1 to 5 parts by volume. They have never met with a sample of lower specific gravity than 0·975 in normal sandal-wood oil, and consider that that figure may be taken to indicate the lowest permissible specific gravity. H. Haensel, dealing with the same test, finds that the conditions can be still more precisely and strictly defined than they are by Cripps, especially in reference to the rotation of polarized light and solubility in dilute alcohol. He has found East Indian sandal-wood oil to be clearly soluble, even when the rectified spirit only contained 90 per cent. of alcohol by volume, and four volumes of it were mixed with one volume of distilled water. In these five volumes one volume of the East Indian sandal-wood oil dissolved quite clear. With respect to polarization, he has recently again experimented with the fresh oil, and has determined that the portion of oil first passing over rotates more strongly to the left than the subsequent fraction, having a specific rotation of 50·50° in a

200 mm. tube, whilst that of the latter is 47·90°. The rotation to the left in an East Indian sandal-wood oil is therefore very marked.

Pine Needle Oils. J. Bertram and H. Walbaum. (*Archiv der Pharm.*, ccxxxi. 290–305. From *Journ. Chem. Soc.*) A number of samples of pine needle oil have been investigated by the authors, partly to provide data for the detection of sophistication, and partly to determine the various constituents; the latter have been identified both by their physical properties and by the preparation of well-characterized derivatives. The rotatory powers were observed in a 100 mm. tube. The oil from the needles of *Abies pectinata*, D.C., is lævorotatory; the sp. gr. = 0·875 at 15°; the rotatory power = −20° 40′; on distillation under ordinary pressures 8 per cent. passes over at 150–170°, and 55 per cent. at 170–185°; at higher temperatures decomposition takes place. The oil consists of lævopinene, lævolimonene, lævobornylic acetate (4·5 per cent.), and sesquiterpene (Wallach's cadinene).

Pine twig oil from *Abies pectinata*, D.C., has been investigated by Wallach; the sp. gr. = 0·854; rotatory power = −72°; on distillation, 16 per cent. passes over at 150–170°, and 76 per cent. at 170–185°. The oil consists of lævopinene, lævolimonene, and bornylic acetate (about 0·5 per cent.).

Spruce oil from *Abies canadensis*, L., consists of lævopinene, lævobornylic acetate (36 per cent.), and cadinene. The sp. gr. = 0·907°; the rotatory power = − 20° 54′; 11 per cent. passes over at 150–170°, and 37 per cent. at 170–185°.

The needles and twigs of *Picea vulgaris*, Lk., yield an oil of sp. gr. = 0·888 at 15°; the rotatory power = − 21° 40′; 20 per cent. distils at 160–170°, and 50 per cent. at 170–185°; the oil consists of lævopinene, lævophellandrene, dipentene, lævobornylic acetate (8·3 per cent.), and cadinene.

The oil of *Pinus pumilio*, Haenke, has already been investigated by Atterberg (*Ber.*, 14, 2530); the sp. gr. = 0·865 at 15°; the rotatory power = − 9°; 70 per cent. distils at 170–185°; the oil consists of lævopinene, lævophellandrene, silvestrene, bornylic acetate (5 per cent.), cadinene, and probably a little dextropinene.

Swedish pine needle oil from *Pinus silvestris*, L., is dextrorotatory, = + 10° 40′; the sp. gr. = 0·872 at 15°; 44 per cent. distils at 160–170°, and 40 per cent. at 170–185°; the oil consists of dextropinene, dextrosilvestrene, and probably bornylic acetate. A sample of oil of the same kind as that just described, but from trees grown in Germany, is also dextrorotatory, = + 10°; the sp. gr. =

0·886 at 15°; 10 per cent. distils at 160–170°, and 46 per cent. at 170–185°. The oil is composed of dextropinene, dextrosilvestrene, and cadinene, an acetate which is probably the bornyl salt, and perhaps a little dipentene.

The characteristic odour of pine oils is due to the presence of bornylic acetate. The authors have prepared both modifications synthetically; the lævorotatory compound is identical with the natural product; the dextrorotatory modification only differs in the sign of its rotation. The acetate is deposited from light petroleum in large, hemihedral crystals belonging to the rhombic system; for the dextro-modification $a : b : c = 0{\cdot}69653 : 1 : 0{\cdot}45362$; for the natural lævo-modification $a : b : c = 0{\cdot}69934 : 1 : 0{\cdot}46171$; it melts at 29°, boils at 98°; the sp. gr. = 0·091; the rotatory power = 38° 20′. *Bornylic formate* boils at 90°; the sp. gr. = 1·013; refractive power = + 31°. *Bornylic propionate* boils at 109–110°; sp. gr. = 0·979°; refractive power = + 24°. *Bornylic butyrate* boils at 120–121°; sp. gr. = 0·966; refractive power = + 22°. *Bornylic valerate* boils at 128–130°; sp. gr. = 0·956°; refractive power = + 20°. The boiling-points of the above salts were observed under a pressure of 10 mm., the sp. gr. at 15°; they resemble the acetate in general properties, but the characteristic odour decreases with increasing molecular weight.

American Oil of Turpentine. J. H. Long. (*Journ. Analyt. Chem.*, vii. 99–108.) The specific gravity and specific rotation of nearly 40 samples of oil of turpentine have been determined, including commerical products and specimens prepared in the manner described by the author, so as to exclude changes brought about by exposure to air or during distillation. It appears from these results that the oil collected from spruce trees is lævorotatory, $[\alpha]_D = -34{\cdot}828$; in two cases the rotation was greater than that observed by Tilden for pure australene, namely, + 29·581 and + 25·114 respectively. Exposure of the gum on the trees does not appear to lower the rotatory power of the product. Pinene is accompanied in the turpentine by a lævorotatory compound of higher boiling-point, and the author suggests that this may possibly be the hitherto unknown lævorotatory cymene. On exposure to light during 20 days, commercial turpentine exhibits a slight increase in rotation; but no precautions were taken to exclude moisture, or even air. By the action of air, the specific rotation, specific gravity, and boiling-point rise, and the turpentine becomes yellow.

Oils of Anise. P. W. Squire. (*Pharm. Journ.*, 3rd series,

sufficiently saturated with hydrochloric acid. The reagent used above had a sp. gr. of ·970 and contained 27 per cent. by weight of hydrochloric acid gas. With an acid of half that strength, the characteristic blue colour is not produced.

Recognition of the Purity of Eucalyptus Oil. H. Helbing and F. W. Passmore. (*Chemist and Druggist*, December 23rd, 1893.) The authors agree with D. B. Dott that the eucalyptol is the essential constituent of this oil; but, while admitting that it is more or less tedious to freeze out the eucalyptol in the various fractions obtained in the distillation of the oil, they adhere to the opinion that this is the only available method yielding satisfactory results.

In order to show that no reliance can be placed on oils of which 50 per cent. distils over between 170° and 180° C., the authors give in the following table a number of instances of oils examined by them in 1893, showing that in spite of 50 per cent. of these oils distilling between 170° and 178° C., the percentage of crystallizable eucalyptol in those fractions was very small. The table also gives the actual proportions of eucalyptol which the oils were found to contain.

	170–178° C.		178–175° C.		175–178° C.		Total percentage of Eucalyptol.
	Per cent. of Oil.	Per cent. of Eucalyptol.	Per cent. of Oil.	Per cent. of Eucalyptol.	Per cent. of Oil.	Per cent. of Eucalyptol.	
1	9·4	—	24·6	—	22·9	8·5	36·0
2	15·7	—	20·8	—	22·6	—	31·1
3	14·4	—	18·0	—	19·6	2·5	30·1
4	28·9	—	15·0	—	16·2	—	15·9
5	·9	—	36·0	—	29·1	—	—

The authors disagree with D. B. Dott's statement that the fractions from 180° to 190° C. do not yield crystallizable eucalyptol when placed in a freezing-mixture. They deny having represented that the fraction from 170° to 190° C. should be taken as eucalyptol, but assert again that in a good oil 80 per cent. should distil between these two temperatures, and that the fractions thus obtained should be put into a freezing-mixture in order to ascertain the crystallizable eucalyptol therein. They point out that even when the fractional distillation is cautiously carried out, eucalyptol is scarcely found in any fraction under 175° C., the bulk coming over between 175° and 185° C., whilst the fraction

185° to 190° C. nearly corresponds with that obtained between 170° and 175° C. in the proportion of eucalyptol. As evidence on this point, they append twenty-eight typical analyses, giving the amount of oil and the yield of eucalyptol in the various fractions.

	170–178° C.		173–175° C.		175–178° C.		178–185° C.		185–190° C.		Total.
	Per cent. of Oil.	Per cent. of Eucalyptol.	Per cent. of Oil.	Per cent. of Eucalyptol.	Per cent. of Oil.	Per cent. of Eucalyptol.	Per cent. of Oil.	Per cent. of Eucalyptol.	Per cent. of Oil.	Per cent. of Eucalyptol.	
1	16·6	—	21·6	—	22·2	7·4	17·6	11·5	5·3	4·7	40·0
2	2·6	—	15·7	—	31·4	7·0	28·4	19·0	6·9	5·9	50·2
3	2·6	—	15·4	—	33·6	1·8	27·2	19·0	4·4	3·2	41·0
4	·3	—	17·3	—	33·7	3·8	26·5	8·0	5·5	—	34·5
5	17·1	—	23·0	—	19·3	5·5	18·5	5·8	5·1	2·8	35·5
6	1·4	—	4·7	—	45·1	7·6	28·2	·8	5·6	—	30·7
7	10·0	—	24·1	2·0	22·7	9·5	22·1	15·0	5·0	2·2	44·4
8	20·2	—	20·8	1·4	22·2	7·7	18·5	9·2	4·4	3·1	41·4
9	2·7	—	19·7	—	32·3	2·0	24·9	1·3	4·6	—	23·6
10	22·6	—	18·4	1·8	20·4	6·8	17·6	9·3	4·6	2·5	41·2
11	13·6	—	21·9	—	20·9	9·5	21·1	10·9	5·9	3·8	41·4
12	1·2	—	7·7	1·8	39·6	8·4	29·0	15·3	5·4	3·0	52·9
13	14·6	—	22·7	3·3	23·4	11·3	20·0	13·9	4·7	3·4	50·0
14	1·2	—	2·1	·5	37·0	9·8	33·5	24·4	5·9	2·8	56·2
15	13·3	—	20·2	2·5	22·5	12·0	20·2	15·8	6·1	5·6	40·2
16	5·8	—	18·0	1·6	26·1	12·0	24·9	14·2	6·2	4·0	44·9
17	22·4	—	17·2	5·2	16·0	11·4	17·8	15·0	4·2	3·3	47·5
18	·9	—	13·3	1·3	27·7	9·5	31·0	23·7	7·0	5·2	58·3
19	·1	—	1·0	·4	59·8	31·1	23·2	14·9	3·4	—	60·3
20	·6	—	4·3	—	44·8	13·6	29·3	16·4	6·7	2·5	47·5
21	·6	—	6·1	2·9	44·3	15·2	28·7	15·4	6·7	4·2	54·5
22	12·0	—	23·7	4·2	23·0	11·2	21·0	13·3	6·3	4·3	49·1
23	23·2	—	20·8	3·3	17·0	7·1	18·2	14·0	5·7	4·6	47·3
24	·8	—	15·7	—	34·9	4·9	26·8	15·9	6·4	4·6	47·5
25	3·3	—	16·6	11·4	58·5	43·2	14·6	10·2	7·0	—	64·8
26	1·0	—	11·1	7·5	62·1	45·6	18·9	11·4	6·9	—	67·5
27	2·4	—	16·8	10·4	38·6	24·7	25·3	20·7	4·1	3·5	76·9
28	·8	—	1·2	·8	48·4	22·0	35·5	16·9	4·3	·2	64·1

It should be remembered that the authors refractionate the liquid left after the eucalyptol has been frozen out, and that the total amount of eucalyptol in the table refers to the combined yield of the first and second crystallizations. Also that, in this redistillation, the eucalyptol is contained particularly in the fractions from 175° to 185° C., the lower-boiling eucalyptol being always more or less retained in the distillation by the higher-boiling constituents of eucalyptus oil.

The Purity of Eucalyptus Oil. D. B. Dott. (*Pharm. Journ.*, 3rd series, xxiv. 510.) Helbing and Passmore have suggested ·910 to ·930 as the range of specific gravity of this oil. The author prefers to fix the limits at ·900–·930. He does not regard the polariscope of much use in the examination of this oil. Referring to the distillation of the oil, he is inclined to regard the fraction passing over between 170° and 180° C. the best as representing eucalyptol. The suggestion to introduce the freezing-out test is not considered by him as at all practicable. Of a large number of samples examined by him during the last five years, he gives the results of the following six :—

	A.	B.	C.	D.	E.	F.
Sp. gr. . . .	·9087	·9115	·9144	·9130	·9123	·9177
		100 c.c.	of each	distilled		
Below 170° . .	18·8	33·0	5·0	25·5	17·3	18·6
170—180° . .	58·0	57·2	69·0	64·3	59·3	56·9
180—190° . .	11·6	5·2	12·6	6·6	13·6	13·9
Above 190° . .	11·1	4·4	13·3	3·5	9·3	10·5
	99·5	99·8	99·9	99·9	99·5	99·9

From the results of Davies and Pearmain as to the solubility of salicylic acid in mixtures of eucalyptol and terpenes, it is concluded that the degree of solvent action of the oil on salicylic acid cannot be retained as a test. The determination of iodine absorption is not found to be a convenient process, and the nitrous acid and bisulphite tests for phellandrene and aldehydes, though of admitted importance, have not given distinct reactions with any sample of oil examined by the author in recent times.

New Essential Oils. Schimmel & Co. (*Pharm. Journ.*, from the authors' report for April, 1894.) Ground ivy (*Glechoma hederacea*) yields 0·03 per cent. of an essential oil, of sp. gr. 0·925 at 15°. It is dark green in colour, and not agreeable in odour. Parsley root (*Apium petroselinum*) yields 0·08 per cent. of an oil of sp. gr. 1·049, from which crystals (probably of apiol) separate. German thyme yields 1·26 per cent. of an oil (sp. gr. 0·928) containing 24 per cent. of phenols, chiefly thymol. Oil of Canada snake root, from the rhizome of *Asarum canadense*, is soluble in twice its volume of 70 per cent. alcohol. The fruit of *Chenopodium ambrosioidis*, var. *anthelminticum*, Gray, yields 1·03 per cent. of a bright yellow oil of sp. gr. 0·910 at 15° and opt. rot. −18° 55′ in a

100 mm. tube. The oil from the herb is very similar, but has a sp. gr. of 0·879 and opt. rot. – 32° 55′. Neither oil gives a perfectly clear solution with ten times its volume of 70 per cent. alcohol, but age probably modifies them in this respect. Oil of golden rod (*Solidago canadensis*) is light yellow in colour and agreeable in odour. Sp. gr. 0·859, and opt. rot. – 11° 10′. The yield from the fresh herb was 0·63 per cent. The leaves of red cedar (*Juniperus virginiana*) yield 0·2 per cent. of a pale greenish-yellow oil, with an orange-like odour. Its specific gravity is 0·886 and optical rotation + 59° 5′.

Terpeneless Essential Oils. V. Coblentz. (From the *Alumni Journal.*) The strength of these preparations varies according to the comparative amount of terpenes contained in the crude oils. The smaller the proportion of the oxygenated constituent after the removal of the terpenes, the more concentrated is the product. The following table is given :—

	Comparative strength to other Oils.
Terpeneless Oils of Angelica, Lemon, Orange	30x
Terpeneless Oil of Juniper Berries	20x
„ „ Calamus	8x
„ „ Wormwood	10x
„ „ Coriander Seed	6x
„ „ Thyme	5x
„ Oils of Cumin, Laurel, Mace, Rosemary	4x
Terpeneless Oils of Anise, Bergamot, Caraway, Cassia, Clove, Fennel, Lavender, Lemon-grass, Peppermint, Pimenta, Sassafras	2 to 2½x

The value of these products may be summed up as follows: great concentration, easy solubility, and freedom from the terebinthinate odour or flavour. These points adapt them specially in the manufacture of liquors, essences, perfumes, confections, etc. A brief sketch of the history of this subject is also given in this paper.

The Use of Sodium Salicylate in the Preparation of Essential Oils. W. Lenz. (*Zeitschr. für analyt. Chem.*, xxxiii. 193.) In the case of cloves and mace the author has obtained a notable increase in the yield of volatile oils by moistening the powdered drugs with a 50 per cent. solution of sodium salicylate previous to distillation.

Salacetol. Prof. Bourget. (*Pharm. Zeitung*, xxxviii. 496.)

Salacetol or salicylacetol is an artificial glucoside introduced a short time ago by P. Fritsch (*Year-Book of Pharmacy*, 1893, 66), and is intended to replace salol and sodium salicylate in medicine. The author finds that it is rapidly broken up in the organism, as within half an hour after its administration salicylic acid can be detected in the urine. The author has also found salacetol useful in cases of incipient diarrhœa, 2 or 3 grams being given with a small dose of castor oil first thing in the morning, and repeated if necessary. The dose for children is from ½ gram to 1 gram, according to age.

Alphol, a New Therapeutic Agent. (*Journ. de Pharm. Alsass. Loth. and Bulletin Comm.*, xxii. 85. From *Pharm. Journ.*) This is a salicylic ether of α-naphthol, and an isomer of "betol," the corresponding derivative of β-naphthol. It is prepared by heating a mixture of sodium salicylate, sodium α-naphthalate, and phosphorus oxychloride, to a temperature of 120° to 130°. Alphol, sodium metaphosphate, and sodium chloride are formed, thus:—

$$2\,Na\,C_7H_5O_3 + 2\,Na\,C_{10}H_7O + PO\,Cl_3 = 2\,C_{10}H_7(O\,C_6H_4)\,C\,O_2H + Na\,PO_3 + 3\,Na\,Cl.$$

The sodium salts are removed by washing with water, and the alphol is then purified by crystallization from alcohol. The compound is said to resemble salol in its therapeutic effects, and to split up into salicylic acid and α-naphthol in contact with the pancreatic and intestinal juices. The dose is from ½ to 2 grams.

Asaprol, a New Antipyretic. Drs. Dujardin-Beaumetz and Stackler. (*Comptes Rendus*, cxvi. 1477.) This name is given to a calcium compound of the sulphonic ether of β-naphthol, and is introduced as an efficient antiseptic and antirheumatic, equal in its effects to sodium salicylate. It is given in the same doses, and is stated to be comparatively free from the objectionable effects of the latter. It is described as a white powder, very soluble in water and alcohol.

Malakin. A. Jaquet. (*Brit. Med. Journ.*, from *Correspond. Blatt. für Schweiz. Aerzte.*) The new antipyretic and antirheumatic remedy introduced under this name is the salicyl derivative of paraphenetidin; its composition is represented by the following formula:—

$$C_6H_4 < \begin{matrix} O\,C_2H_5 \\ N = C - C_6H_4\,O\,H \\ \quad\quad | \\ \quad\quad H \end{matrix}$$

It occurs in the form of small, light-yellow needles, which melt at

a temperature of 197·6° F. Malakin is insoluble in water, slightly soluble in cold and moderately soluble in hot alcohol. Mineral acids, such as hydrochloric acid, even in 1 in 3,000 dilution, decompose it, salicyl-aldehyde and paraphenetidin being formed. The urine gives the salicyl reaction within twenty minutes of the ingestion of the drug.

Its action is that of salicylic acid, the salicyl-aldehyde being changed into salicylic acid in the tissues. The usual single dose is 1 gram, the amount given in a day varying from 4 to 6 grams. Owing to its insolubility in water, the drug is generally given in wafers, or in plum or apple jelly.

The harmlessness of the remedy, especially as regards the circulatory system, having previously been tested in guinea-pigs, it was tried by the author in seventy-four cases, including fourteen of acute rheumatism, thirteen of enteric fever, seven of croupous pneumonia, nineteen of tuberculosis in different stages, seven of erysipelas, two of scarlatina, and twelve of neuralgia and headache.

In the rheumatic cases, several of which were of severe type, the effect was uniformly good; in the febrile cases the fall of temperature was gradual and not excessive, the lowest point being reached in three to four hours; there was no perspiration or collapse, and the effect lasted a considerable time. In the cases of neuralgia the effect showed itself only after one or two hours, and in severe cases the pain was not completely relieved. The drug in such cases is less efficacious than antipyrine.

The following are the author's conclusions:—Malakin is a valuable and trustworthy remedy in acute articular rheumatism, its use being unattended with unpleasant secondary effects. He believes that the salicylic acid in the nascent state derived from malakin is effective against the rheumatic poison in smaller doses than when the acid is given in the ordinary way. The slowness and evenness of its antipyretic action make it especially valuable in the case of children and weakly patients. It may be given for a long time in cases of neuralgia and habitual headache without injury.

Lycetol, a New Diuretic. (*Apoth. Zeitung*, ix. 76.) The body introduced under this name by Bayer & Co. for therapeutic use, and represented as dimethylpiperazine, is reported by H. Wittzack to be a comparatively harmless but efficient diuretic, having at least as great a solvent action on uric acid as piperazine. Gouty symptoms are stated to be relieved by its prolonged ad-

ministration. According to Thoms, the base contained in this preparation may be regarded as dipropylenediamine, dimethyl-piperazine being derived from propylene in the same manner as piperazine is derived from ethylene.

Nasrol, a New Diuretic. (*Journ. de Pharm. d'Anvers*, November, 1893, 415.) This name is applied to sulphocaffeinate of sodium, which is recommended as a most efficient diuretic. It is slightly soluble in cold and freely soluble in hot water, and has a marked bitter taste.

Neurodin and Thermodin. (*Pharm. Zeitung*, 1893, 785.) Neurodin, or acetyl-*p*-oxyphenyl ethyl carbamate, $C_6H_4(OCOCH_3)(NHCOOC_2H_5)$, and thermodin, or acetyl-*p*-ethoxy phenyl-ethyl carbamate, $C_6H_4(OC_2H_5)N(COCH_3)(COOC_2H_5)$, are colourless, crystallizable substances, almost insoluble in water and melting at about 87° C. The former is used chiefly as an antineuralgic in doses of 0·5–1·5 gram; the latter as an antipyretic in doses of 0·5–0·7 gram.

Sedatin. (*Pharm. Rundschau*, 1893, 497.) This new sedative is stated to be paravalerylphenetidin, and to be obtained by the action of valerianic acid upon phenetidin, or by that of phenetidin hydrochlorate upon sodium valerianate. The product crystallizes in fine needles, boiling at 350–360° C., and is but slightly soluble in benzol, ether, chloroform, acetone and cold ethyl and methyl alcohols, but freely soluble in these two alcohols when hot.

Chloralose. M. Hanriot and C. Richet. (*Comptes Rendus*, cxvii. 734–737.) This new hypnotic (*Year-Book of Pharmacy*, 1893, 185) is now shown to have a composition corresponding to the formula $C_8H_{11}ClO_6$, and not $C_8H_{11}Cl_3O_6$ as previously stated. It is a white crystalline powder, fusing at 187° C., soluble in alcohol, but only slightly soluble in water or ether. Its boiling aqueous solution reduces neither ammoniacal silver nitrate nor Fehling's solution. Acids are without effect on it, but alkalies change the colour of the hot solution to brown. It is best administered in cachets containing 3 grains each.

Sanguinal, a New Blood Tonic. (*Pharm. Centralhalle*, 1893, 687.) This preparation is stated to consist of 10 per cent. of oxyhæmoglobin, 44 per cent. of peptonized albuminoids, and 46 per cent. of the ash constituents of blood.

Ferratin. O. Schmiedeberg. (*Répertoire* [3], vi. 21; *Practitioner*, li. 427.) This name was originally given by the author to an organic iron compound isolated from pig's liver, and is regarded as a normal constituent of the organs of the animal

body, in the tissues of which it is stored up as a reserve material for the formation of blood. An analogous compound can be prepared artificially by treating an aqueous solution of egg albumen with the tartrates of potassium and iron, and then adding solution of caustic soda, whereby the ferratin is precipitated in the form of a reddish-brown, neutral, odourless, and tasteless powder, containing about 7 per cent. of readily assimilable iron. The dose for adults is 0·3–0·5 gram three times daily, and for children ·03–·05 gram likewise administered three times a day. A sodium compound of this body has also been prepared. It is soluble in water and is given in the same doses.

Physiological Action of Drugs containing Iron. C. T. Mörner. (*Zeitschr. für physiol. Chem.*, xviii. 13–20.) Many observers state that inorganic iron salts are not absorbed. The normal supply of iron is hæmatogen, an iron-containing organic compound of the nature of nucleo-albumen. If growing animals are deprived of this, they waste in spite of the administration of inorganic iron. Bunge explains the usefulness of inorganic iron in chlorosis by supposing that the putrefaction processes in the intestines destroy hæmatogen, but that this is protected by the presence of simple iron compounds which leave the body in the fæces as iron sulphide. In chlorosis, also, the natural antiseptic, the hydrochloric acid of the gastric juice, occurs in less than normal proportion. These views of Bunge suggest certain difficulties, and a question here investigated is, Are iron salts antiseptics? The amount of ethereal hydrogen sulphates in the urine is a measure of the amount of putrefactive change in the intestine. By experiments on the author's own person for five periods, two without and three with iron, the proportion of the two classes of urinary sulphates was practically the same (1 : 10·4 for the iron periods, 1 : 10·9 for the other periods). Iron salts, therefore, do not appear to be antiseptics; their usefulness seems rather to depend on the readiness with which they form the sulphide, and so remove sulphuretted hydrogen from the alimentary canal.

Action of Iron in Chlorosis. R. Stockman. (*Brit. Med. Journ.*, 1893, i. 881–885, 942–944.) The author refers to the well-established fact that inorganic preparations of iron are thoroughly efficient remedies for chlorosis, and arrives at the conclusion that they are superior in this respect, and quicker in their action than organic iron compounds, such as blood, hæmatin, or the preparations from blood introduced and described by Kobert

under the names *hæmol* and *hæmogallol* (see *Year-Book of Pharmacy*, 1892, 198). These preparations, although they have the merit of being entirely non-irritating, have not proved quite so successful as therapeutic agents as was expected.

The author considers that the curative effects of iron salts are not merely due to their stimulating action, but mainly to the absorption of the iron; and he rejects the theory advanced by Bunge and others (preceding abstract), that inorganic iron, in consuming the sulphuretted hydrogen present in the intestines by the formation of inert iron sulphide, saves organically combined iron, such as naturally occurs in food, from being similarly wasted and prevented from absorption into the blood. His conclusions with regard to this explanation are based on the following observations:—

1. Iron inorganic compounds cure chlorosis when given hypodermically.

2. Sulphide of iron itself cures chlorosis.

3. Bismuth, manganese, and other metallic compounds—which are just as capable as iron of combining with sulphuretted hydrogen—do not cure chlorosis.

Bismuth Phenates as Therapeutic Agents. (*L'Union Pharm.*, xxxiv. 354. From *Pharm. Journ.*) On adding a solution of bismuth nitrate to solutions of alkaline phenates, yellow or greyish-brown precipitates are formed, which are insoluble in water and differ in composition according to the phenol used. A combination of tribromo-phenol and bismuth prepared by F. v. Heyden, is said to contain 50 per cent. of the former and practically the same amount of bismuth oxide. It is described as a yellow insoluble powder of neutral reaction, without taste or odour, almost non-toxic, and without action upon the lining of the digestive organs. Hueppe considers this preparation to be almost a specific against cholera, destroying the bacilli and effecting a cure without complications. In the case of adults, 5 to 7 grams, administered in half-gram doses, is said to suffice. F. Jasenski has experimented with three similar compounds—phenol-bismuth, cresol-bismuth, and β-naphthol-bismuth—and finds that, when ingested, they are decomposed both by the gastric and pancreatic juices. The phenol, cresol, and part of the naphthol are absorbed and subsequently eliminated by the kidneys in fresh combinations, whilst the remainder of the naphthol and almost the whole of the bismuth are excreted by the bowels. In daily doses of 1 to 3 grams excellent results are

said to have been obtained by the use of these compounds in acute and chronic intestinal catarrhs. They were also found of service in cases of cancer of the stomach and in allaying the diarrhœa and colic attending certain maladies, whilst Jasenski thinks they should prove valuable in infectious disorders, such as typhoid fever and cholera.

Toxicity and Therapeutic Use of Sodium Fluoride. M. Blaizot. (*Comptes Rendus Soc. Biol.*, 1893, 316–319.) The antiseptic properties attributed to this salt by Arthus and Huber are confirmed by the author's experiments. It is recommended by him as a lotion in various affections of the skin and mucous membranes. It is but slightly toxic, 8 centigrams per kilo. of body weight having in rabbits to be injected intravenously to produce poisonous symptoms; the symptoms are slight fever, salivation, and dyspnœa. The animal recovers in a few hours. After a dose of 1 decigram and upwards, however, the symptoms are more intense, and the animal dies in a comatose condition.

Toxicity of Antiseptics. MM. Désesquelle and Charrin. (*Nouv. Rem.*, x. 159. From *Amer. Drugg. and Pharm. Rec.*) The authors have compared the toxicity and bactericidal power of a number of recently introduced bodies derived from corrosive sublimate, by the replacement of an equivalent of chlorine by equivalents of various phenols and naphthols. The results are represented in the following table, the antiseptic and bactericidal power of sublimate itself being taken as one hundred :—

	Anti-septicity.	Toxi-city.
Phenol sublimate . . .	104	12·5
Mercury hydroxy-phenolate .	46	16
Phenol acetate mixed with Hg .	41	16
Naphthol sublimate . . .	33	27
Mercury β-naphtholate . .	61	25
Mercury acetate . . .	50	45

Though the differences in antiseptic power are very marked, the variation in toxicity is evidently much greater.

Potassium Permanganate as an Antidote. F. Schlagdenhauffen and E. Reeb. (*Journ. der Pharm. von Elsass-Loth.*, xx. 322.) The introduction by J. Antal of potassium permanganate as a successful antidote to phosphorus, muscarine, strychnine, colchicine, oil of savin, and oxalic acid, has induced the authors to investigate its effect upon coronillin, $C_{11}H_{12}O_5$, the bitter toxic principle isolated by them from the leaves of *Coro-*

nilla scorpioides. The results of their experiments prove that permanganate is an efficient antidote to this poison if given within a very short time after the administration of the latter, and that its action is due to the destruction of the poison by oxidation.

Potassium Permanganate as an Antidote to Hydrocyanic Acid and Cyanides. J. Kossa. (*Nouv. Rem.*, ix. 567.) Experiments on animals have confirmed the efficiency of this antidote in cases of poisoning by cyanides in which this remedy was administered without delay. It is suggested that in such cases about one-third to one half of a litre of a weak permanganate solution should be administered immediately.

Antagonistic Action of Calcium and Potassium Salts. S. Ringer and H. Sainsbury. (*Journ. Physiol.*, xvi. 9.) The authors have previously called attention to the importance of calcium salts in vital and coagulation processes, and the antagonism existing between calcium and potassium. They find that calcium salts, both in minimal and massive doses, antagonize the paralyzing influence of potassium salts; and whilst a minimal dose of calcium salt has extraordinary powers of inhibiting the action of large quantities of potassium salts, a massive dose of the latter is most easily overcome by a massive dose of a calcium salt. Sodium appears to contrast with potassium in the relative feebleness of its action, maintaining its character as an indifferent element.

Physiological Action of Quinoline, Isoquinoline, and their Derivatives. R. Stockman. (*Journ. Physiol.*, xv. 245-248. From *Journ. Chem. Soc.*) Quinoline is a strong antiseptic and antipyretic, depressing the central nervous system. No difference, quantitative or qualitative, could be detected between its action and that of isoquinoline. The two methiodides also acted in precisely the same manner, causing a more paralyzing action on the motor nerves than the alkaloids themselves.

The physiological action of quinaldine (α-methylquinoline), lepidine (γ-methylquinoline), αγ-dimethylquinoline, orthotoluquinoline, and paratoluquinoline was also investigated.

Tartrate of quinaldine has an action similar to that of quinoline on frogs and rabbits, but is somewhat less active; the dimethyl compound is still less active. It would appear, therefore, that the substitution of methyl for hydrogen weakens the depressing action on the nervous system. The other substances named act in every respect like quinaldine.

The position of the nitrogen atom or of the methyl group exerts no influence on the physiological action of these substances.

Physiological Action of Hyoscine. G. Sharp. (*Practitioner*, lii. 22.) The author has studied the effects of the hydrobromide of this base, and has not been able to establish any essential difference in the action of this alkaloid and that of atropine. In his opinion, hyoscine should not be recommended as a safe hypnotic, until its chemistry, pharmacology, and clinical effects have been more fully investigated.

Physiological Effects of Scopolamine. M. Rahlmann. (*Semaine Médicale*, July, 1893.) According to Kobert, scopolamine has a paralysing action on the brain and does not accelerate the pulse, differing in this respect from atropine. As a mydriatic, analgesic and antiphlogistic, applied in the form of hydrochloride, it is found by the author to be superior to atropine, and to be free from the objection of causing dryness of the throat, congestion of the head, and acceleration of the heart's action, so commonly observed under the influence of atropine. In glaucomatous conditions it can be injected into the eye, in solution containing one or two per cent.

Hypodermic Application of Duboisine as a Sedative and Hypnotic. (*Nouv. Rem.*, 1893, 239, 240.) Administered subcutaneously in doses of 0·0005–0·0015 gram, duboisine is found by Belmondo to be equal to hyoscine in its sedative action, and superior to chloral as a hypnotic. The neutral sulphate of duboisine, administered in the same way in doses of 0·0005–0·002 gram, has been extensively tried by Mazzochi and Antonini in the treatment of mental disorders, and is regarded by them as superior to both atropine and morphine in its action.

Physiological Action of Apocodeïne. L. Guinard. (*Compt. Rend. Soc. Biol.*, 1893, 586–590.) The experiments were carried out on dogs, apocodeïne hydrochloride being injected hypodermically.

The heart is at first accelerated for a short period; the animal then becomes somnolent or sleeps, and the rate of the heart falls. This is entirely of central origin, and the course of the nervous impulses to the heart is by the pneumogastric nerves; the phenomena can be prevented by section of these nerves. The blood pressure rises in the first and sinks in the second phase; the lowering of pressure is not, however, very great (not nearly as great as that produced by morphine), and is a result of the heart's slower action rather than of vaso-dilatation.

The rate of respiration runs parallel to that of the heart. The body temperature is lowered during the somnolent stage. The quantity of oxygen consumed and carbonic anhydride expired is also considerably lessened. The repose of the skeletal muscles and the slowing of the heart and respiration will partly explain these results; but another factor is believed to be a lessening of inter-organic combustions.

Physiological Action of Pilocarpine. A. Curci. (*Journ. Chem. Soc.*, April, 1894, from *Annali Chim. Farm.*, xviii. 3–8.) Pilocarpine produces hyper-secretion, convulsions, and paralysis. The paralysis is accounted for by regarding pilocarpine as a quaternary ammonium compound. But phenol and oximhydroxyl groups, the most powerful in producing hyper-secretion and convulsions, are absent. It is not improbable, however, that in the organism changes may occur, a pilocarpinate being formed with the bases of the body; thus:—

$$C_5NH_4 \cdot CMe\langle\begin{matrix}CO-\\NMe_3\end{matrix}\rangle O + ROH =$$
$$C_5NH_4 \cdot CMe(NMe_3 \cdot OH) \cdot COOR.$$

In dogs, the drug leaves the body with the urine, partly as free pilocarpine, and partly as such a pilocarpinate.

A New Use for Tuberculin. Dr. Strauss. (*Chemist and Druggist*, January 6th, 1894.) The author regards it as firmly established that tuberculin constitutes an extremely valuable reactive for the diagnosis of tuberculosis in man and animals. He further believes that tuberculous affections are not the only maladies for which tuberculin is an aid at arriving at a correct diagnosis, as it may be also useful in syphilis. In several cases of secondary syphilis the characteristic rise of the temperature was witnessed after an injection of tuberculin. Another series of experiments on other eruptive affections gave no reaction. As a result of his experiments the author concludes that tuberculin is capable of rendering very useful services in the recognition of obscure cases of syphilis.

The Value of Piperazine in the Treatment of Uric Acid Diathesis. J. Gordon. (*Brit. Med. Journ.*, June 16th, 1894.) During the last few years attention has been repeatedly called to the powerful solvent action exercised by piperazine on uric acid, and its probable value therefore as a therapeutic agent in the treatment of uric acid diathesis and calculus. The author has now investigated the merits of this body in this direction, and

describes a series of experiments, the results of which are summarized as follows :—

1. Piperazine is not wholly oxidized in the body, and may be detected in the urine of those to whom it is administered.

2. Piperazine in solution of 1 per cent. in normal urine, when kept in contact at a temperature of 39° C. (body temperature) for a given time, has the property of dissolving to a great extent a fragment of a uric acid calculus.

3. That the stronger the solution of piperazine in urine (up to 7·5 per cent.) the earlier does the solvent action begin, and the more rapid is its completion.

4. That, notwithstanding this, with the stronger solutions of piperazine in urine, the rate of solubility is not so markedly rapid over the weaker solution as might be expected.

5. *That the solvent action of piperazine in similar circumstances is greater than any other of the substances employed in these experiments*, viz., borax, lithium citrate, sodium carbonate, and potassium citrate.

6. That piperazine, in weak and strong solutions in urine, converts the undissolved portion of the calculus into a soft granular or pulpy condition.

7. That neither borax, lithium citrate, sodium carbonate, nor potassium citrate in similar circumstances renders the fragment of calculus soft or pulpy.

The Administration of Bromoform. W. Lyon. (*Pharm. Journ.*, 3rd series, xxiv. 475, 476.) The author's experiments lead to the conclusion that where alcohol is admissible, the glycerin and alcohol mixture suggested by Bedford is the best form of administration, and that in other cases either a solution in oil, or an emulsion with mucilage of acacia or Irish moss may be used with advantage. The formula recommended by Bedford in the Transactions of the American Pharmaceutical Association is as follows :—

Bromoform	16 minims.
Alcohol	2 drachms.
Glycerin	12 „
Compound Tincture of Cardamoms .	2 „

Mix in the order mentioned.

For the preparation of an emulsion with mucilage of acacia the author suggests the following :—

Bromoform	20 minims.
Mucilage	2 drachms.
Water to	1 ounce.

Mucilage of Irish moss is employed in the same proportion as that given for mucilage of acacia in the preceding formula.

Two New Preparations of Iceland Moss. F. v. Oefele. (From *National Drugg.*) The author gives the following formulæ for the preparation of Iceland moss, which is again coming into repute in the treatment of phthisis, anæmia, and other wasting diseases:—

Infusion of Iceland Moss.

Iceland moss	20 parts.
Ammonium carbonate . . .	1 part.
Boiling water	200 parts.

Mix and macerate for thirty minutes, then bring to a boil, strain, and to the colate add 70 parts of absolute alcohol. Allow the mixture to stand until it has settled, then decant and add to the clear liquid 30 parts of liquorice juice. The dose is from one to two tablespoonfuls thrice daily.

Tincture of Iceland Moss.

Iceland moss	20 parts.
Ammonium carbonate . . .	1 part.
Absolute alcohol	100 parts.

Mix and macerate for twenty-four hours, then heat to the boiling-point, strain while hot, allow to stand until cold, and finally filter. Dose, one to two teaspoonfuls thrice daily.

Notes on Belladonna Preparations. W. A. H. Naylor. (*Pharm. Journ.*, 3rd series, xxiv. 561, 562.) *Chloroform of Belladonna.*—The author describes a number of experiments undertaken with the object of testing the value of the B.P.C. process for making this preparation, and arrives at the conclusion, confirmatory of the opinion expressed by P. W. Squire (*Pharm. Journ.*, October 14th, 1893), that the process is a wasteful one, involving the loss of a considerable proportion of the alkaloid contained in the root.

Liquid Belladonna Plaster.—The author has supplemented his work on this subject (*Year-Book of Pharmacy*, 1893, 344) by some further experiments, as a result of which he proposes the following formula:—

Take of—

Ether-extract of belladonna assayed to contain 1½ grain of alkaloid per fluid ounce . .	20 fluid ounces.
Camphor	130 grains.
Pyroxylin	180 „

Dissolve.

The ether extract referred to is made by macerating 20 ounces of belladonna leaves in No. 60 powder in a percolator with 30 fluid ounces of a mixture of equal volumes of ether and rectified spirit for twenty-four hours. At the end of that time percolation is allowed to proceed, the first 10 ounces of percolate are collected apart, and menstruum is added at intervals until the belladonna is wholly deprived of its alkaloid. The second percolate is distilled, the residue further concentrated by evaporation on a water-bath, and then mixed with the reserve portion, the volume of the mixture being so adjusted as to contain the proportion of alkaloid named in the above formula. Only a very slight deposit is formed in the product after standing. It is advisable to assay the leaves to be operated upon, so that the volume of the final product may be approximately calculated. In a trial experiment described by the author, 2 ounces of belladonna leaves, containing 0·470 per cent. of alkaloid (tested by Dunstan and Ransom's process), yielded 2½ fluid ounces of clear extract containing 1·56 grain of alkaloid per fluid ounce.

In the formula for liquid belladonna plaster now recommended, the Canada balsam and castor oil are omitted, since it was observed that the fatty matter dissolved by the menstruum from the belladonna renders the product sufficiently flexible.

Syrup of Iodide of Iron. M. Roussillon. (*Journ. de Pharm.* [5], xxviii. 243.) The following mode of procedure is recommended as yielding a very permanent product:—8 grams of iron filings and 16·4 grams of iodine are heated with 30 grams of water until all the iodine has entered into combination, and the hot solution is then filtered into a vessel containing 220 grams of glycerin. The residue on the filter is washed with boiling water until the contents of the vessel and washings amount together to 240 grams. The mixture is immediately transferred to small bottles and securely corked and sealed. When required for use, the contents of one of these bottles are mixed with sufficient simple syrup so that a quarter of a litre of the product contains 18 grams of the glycerin solution of ferrous iodide. Both the solution and the syrup are stated to possess great stability.

Preservation of Syrup of Iodide of Iron. W. Lyon. (*Pharm. Journ.*, 3rd series, xxiv. 863, 864.) The author suggests the use of about 10 per cent. of pure glucose in the place of a corresponding amount of sugar, as a means of considerably increasing the stability of syrup of iodide of iron. The glucose applied for this purpose requires to be free from acids and metallic salts.

Assay of Syrup of Iodide of Iron. G. Griggi. (*L'Union Pharm.*, October, 1893.) The process recommended by the author is based on the following reaction:—

$$2\,FeI_2 + KClO_3 = Fe_2O_3 + KCl + 2\,I_2.$$

8 grams of the syrup are warmed in a test-tube with 2 c.c. of a 5 per cent. solution of potassium chlorate until the reaction is completed. The mixture after cooling is agitated with chloroform, then allowed to separate, the chloroform solution of the liberated iodine mixed with a sufficient quantity of distilled water, and the iodine titrated with sodium hyposulphite.

Syrup of Tolu. M. Ausaldy. (*Amer. Journ. Pharm.*, from *L'Union Pharm.*, Sept., 1893, 425.) Syrup of tolu balsam, if kept for several months, exhibits alteration in both odour and taste. The author heats such an altered syrup to violent ebullition (above 100° C.), when a disengagement of gas takes place, more or less abundant according to the degree of alteration; upon cooling, the aromatic taste, although not very pronounced, will be found to have returned. Certain authors having suggested that the change rarely occurs in a syrup having an acid reaction, the author prepared the syrup from a balsam of tolu mixture, to which 0·50 cgm. of benzoic acid per litre of liquid had been added, and found the product to keep for more than a year without change.

Preservation of Infusions. E. White. (*Pharm. Journ.*, 3rd series, xxiv. 686, 687.) The author's experiments lead to the following conclusions:—

1. An infusion prepared with boiling water is sterile when perfectly fresh, if care be taken to avoid unnecessary exposure.

2. The infusion so prepared may be kept sterile in a flask in which water has been recently boiled.

3. Raising the contents of the flask to the boiling-point after plugging renders their preservation more certain.

4. Cold infusions may be sterilized by filtration through kieselguhr blocks.

With regard to the preservation of infusions by the addition of antiseptics, the author regards the use of alcohol with disfavour, on account of the large quantity required, and the alteration in physical characters which is often produced in infusions by its addition. He much prefers chloroform, which has already been successfully employed for this purpose, and is efficient in very much smaller proportions (about 1 part to 400 of infusion) without causing any precipitation or other change. The infusion should be in a sterile condition before the chloroform is added.

Examination of Commercial Samples of Compound Infusion of Gentian. J. Barclay. (*Pharm. Journ.*, 3rd series, xxiv. 693, 694.) The results of the author's examination of eight commercial samples of this infusion are given in the following table:—

No. of sample.	Sp. gr.	Extractive dried at 100° C. Per cent.	Proof spirit. Per cent.	Appearance.
B.P.		0·855		
1	1·013	7·2	21·11	Very slightly opal
2	0·9835	2·3	38·87	Almost bright
3	0·994	4·3	31·61	Bright
4	0·987	2·7	35·47	Bright
5	0·9945	3·8	31·03	Brilliant dark
6	0·999	4·21	24·36	Bright dark
7	1·005	5·52	23·54	Slightly opal
8	1·010	6·47	21·11	Slightly opal

A pint of compound infusion of gentian, made according to the directions of the Pharmacopœia, was next prepared, and gave ·855 per cent. of extractive matter. A concentrated preparation holding in solution eight times the amount of extractive matter found in the fresh infusion should therefore yield 6·84 per cent. of extractive. Only two of the specimens examined approached this figure; the majority contained very much less. The aroma and taste of the samples varied considerably; the smell of lemon being apparent in some, and indistinct or quite absent in others, while the bitterness also varied considerably in the different samples.

The Preparation of Aromatic Waters. M. A. Miner. (From *The Apothecary.*) The author suggests an improvement in the process of the U.S. Pharmacopœia for the preparation of aromatic waters, consisting in the application of a much larger proportion of calcium phosphate. In his opinion the latter should be present in such excess that when triturated with the oil, the mixture will present the form of a mobile powder, containing the oil in very minute division, and mixing readily with water without evident separation of oily particles. Experimenting with various proportions, it was found that a powder of that character is obtained when twenty grams of calcium phosphate are titrated with two cubic-centimetres of volatile oil. The water is then gradually added to this in the usual manner. Before filtration the mixture should be shaken at frequent intervals.

Ethereal Extract of Male-Fern. W. Peters. (*Apotheker Zeitung*, 1893, 594.) The author states that this extract, if quite

pure, has a yellowish-green colour, and that the pure green colour of most commercial samples is due to the presence of copper emanating from the use of copper vessels in its preparation. He therefore recommends that any sample of this extract having a suspicious appearance should be tested for this metal.

Extract of Ergot. C. C. Keller. (*Amer. Drugg. and Pharm. Record*, May 10th, 1894, from *Apoth. Zeitung.*) The author has arrived at the conclusion that of all the processes suggested for the preparation of this extract, that of the third edition of the Swiss Pharmacopœia is the best, and most on a level with the present state of scientific knowledge respecting this drug. The *modus operandi* is as follows:—

One thousand parts of ergot are damped uniformly with 500 parts of diluted alcohol, and allowed to stand for twelve hours in a well-covered vessel. The moist powder is passed through a sieve and fully exhausted in a percolator with diluted alcohol. If the percolation is properly conducted, this is accomplished when the percolate amounts to about four to five times the weight of the ergot. The percolate is now evaporated to 250 parts in a vacuum, if possible, and with constant stirring. Now add 250 parts of water, warm for a short time and allow to cool, when oily and resinous masses will separate out. Filter, and to the clear, dark, reddish-brown filtrate add 50 parts of 10 per cent. hydrochloric acid. Shake up the liquid and allow to stand for 24 hours. The sclererythrin, the colouring matter of ergot, will then separate out in a flocculent precipitate. Now filter and wash, and to the filtrate add 20 parts of crystallized sodium carbonate. When the evolution of carbon dioxide ceases, evaporate to 150 parts; finally add 15 parts of glycerin, and evaporate to 125 parts. One part of the extract now represents eight parts of the ergot. It is of a thin, almost liquid consistence.

The aqueous solution of the extract (1 to 20) should be of a reddish-yellow colour. Extracts which are not prepared according to the above formula yield a dark-brown solution. If 3 c.c. of this solution of the extract are diluted with 7 c.c. of alcohol, the mixture should remain perfectly clear, even after standing some time. Other extracts will yield a precipitate. The aqueous extract should turn litmus paper slightly red (alkaline solutions are easily decomposed). On the addition of iodide of mercury and potassium no cloudiness should be produced. An excess of acid causes pain when the solution is injected. If Mayer's reagent be mixed with a solution of the extract, and

hydrochloric acid added, a copious yellowish-white precipitate should be formed (extracts not made according to this formula yield dark precipitates).

Ten c.c. of the extract solution (1 to 20), on being acidified with 5 drops of diluted hydrochloric acid, and on addition of 1 c.c. of picric acid solution (1 to 150), should become muddy at once, and yield a flocculent precipitate after a few minutes. This reaction is a direct and approximately quantitative test of the active alkaloid of ergot present, since the flocculent precipitate yielded by a preparation prepared carefully according to the Swiss Pharmacopœia consists practically of cornutine picrate. Ergotinic acid and its decomposition products are not precipitated under these conditions. Only an ergot rich in alkaloid and an extract carefully prepared will show the reaction indicated. The cornutine in the precipitate can be identified by the usual test after having been isolated by means of hydrochloric acid, ammonia, etc.

For hypodermic use the following solution is recommended :—

	Parts
Extract of ergot (as above)	50
Sterilized water	25
Glycerin	25

One part of this solution represents four parts of ergot. The author is unable to confirm Kobert's view that all solutions of extract of ergot lose their activity in a relatively short time, since he has found the proportion of cornutine present in a fluid extract made from a Spanish ergot unchanged after many years.

Quebracho Extract. A. Kremel. (*Oesterr. Zeitschr. für Pharm.*, from *Pharm. Zeitung*, 1894, 91.) The author points out that a good deal of the extract met with in the market under the above name is not obtained from true quebracho bark, but from the bark of *Loxopterygium Lorentzii*, which is known as "quebracho colorado." Both drugs have been studied previously, the latter having been shown to be very rich in tannin, while the former contains several distinct alkaloids. As these constituents also occur in the respective extracts, a solution of the genuine extract gives a copious precipitate with tannin, while a solution of the extract of quebracho colorado does not react with tannin, but forms a precipitate with a solution of the genuine quebracho extract.

Fluid Extract of Digitalis. E. Fayn. (*Journ. de Pharm. d'Anvers*, August, 1893.) This preparation, made according to the following directions, has been introduced into the new Danish Pharmacopœia.

1000 grams of dried digitalis leaves are macerated for two hours with 50 grams of glycerin and 450 grams of dilute alcohol, and then percolated with 6000 grams of dilute alcohol. The percolate is distilled until only 1000 grams remain, the extract diluted with 2000 grams of water, the mixture evaporated down to 1500 grams, filtered, and again evaporated until the residue amounts to 500 grams, to which 500 grams of alcohol are now added so as to obtain 1000 grams of product. The resulting extract has a dark-green colour, and is given in doses of 0·1 to 0·5 gram. Infusion of digitalis may be dispensed by adding water to this extract in the required proportion.

Processes for the Assay of Fluid Extract of Hydrastis Canadensis. E. G. Eberhardt. (*Amer. Journ. Pharm.*, 1893, 374–378.) 25 c.c. of the fluid extract are warmed on a water-bath in an Erlenmeyer flask of at least 4 ounces capacity. 10 c.c. of ether are then added slowly and carefully, so as not to cause loss by ebullition, and afterwards 25 c.c. of a 2 per cent. solution of ammonia. The contents of the flask are rotated briskly for a few seconds, and then set aside for twelve hours, repeating the rotation frequently for two or three hours. The liquid is then transferred to a dried and weighed funnel, into the neck of which a small plug of cotton has been previously inserted. When all the liquid has passed through, the crystals remaining in the flask are carefully rinsed into the funnel, and washed with distilled water until the washings pass off free from colour. The funnel and contents are now dried at a temperature not exceeding 100° C., cooled in a desiccator, and weighed. By subtracting the weight of the funnel and cotton the amount of alkaloid is obtained.

An alternative process of assay consists in rendering 25 c.c. of fluid extract alkaline with ammonia, and rotating in a separator with three separate portions of ether of 15 c.c. each, extracting the alkaloid from the mixed ether washings by agitating them with three portions of 10 c.c. each of 2 per cent. sulphuric acid, and lastly with 5 c.c. of distilled water, adding to the combined washings 10 c.c. of alcohol, 3 c.c. of ether, and ammonia sufficient to render alkaline. After allowing to stand for six hours with frequent agitation, the crystals are collected, dried, and weighed.

The Alkaloidal Assay of Fluid Extract of Cinchona. W. Duncan. (*Pharm. Journ.*, 3rd series, xxiv. 885.) In the assay of this preparation the solvent is apt to form an emulsion with the alkaline liquor, thus causing the two liquids to separate slowly

and imperfectly. The author finds that this difficulty may be minimised by modifying the official process as follows:—

Take 100 fluid grains of the extract and dilute with distilled water to one fluid ounce. Filter off half a fluid ounce (equal to 50 fluid grains), and transfer to a separator. Then proceed as the Pharmacopœia directs. The acidity of the extract prevents any alkaloid from being precipitated with the resins and colouring matter.

The Value of Titration with Standardized Acids for Assaying Alkaloidal Drugs and Galenical Preparations. C. Caspari and A. R. L. Dohme. (*Amer. Journ. Pharm.*, 1893, 473–478.) The results of the authors' experiments are summarized in the following table and conclusions:—

Fluid Extract.	Gravimetric.				Volumetric.			
	Method of Lyons.	Method of Lloyd.	Method of Beckurts.	Method of Thompson.	Method of Lyons.	Method of Lloyd.	Method of Beckurts.	Method of Thompson.
Aconite Root . .	0·311*	0·446	1·947	0 640	0·128	0·437	0·517	0·599
Belladonna Leaves	0·300	0·428	1·445	0·380	0·289	0·315	0·339	0·318
Belladonna Root .	0·338	0·318	1·135	0·424	0·338	0·309	0·348	0·335
Bloodroot	1·232	1·560	—	—	†	†	—	—
Cinchona	3·41	3·49	—	4·70	3·21	3·20	—	4·40
Coca Leaves . . .	0·969	0·806	—	0·680	0·563	0·533	—	—
Colchicum Seed. .	0·682	0·600	—	—	†	†	—	—
Conium Fruit . .	0·567	0·699	—	—	‡	‡	—	—
Gelsemium . . .	2·190	0·836	1·920	0·400	0·285	0·277	0·408	0·392
Henbane	0·265	0·306	—	—	0·231	0·254	—	—
			Keller.				Keller.	
Ipecacuanha. . .	1·815	1·478	2·01	2·90	1·570	1·465	1·51	0·93
Jaborandi. . . .	0·443	0·884	—	0·510	0·166	0·249	—	0·266
			Beckurts.				Beckurts.	
Nux Vomica. . .	1·776	1·789	3·005	1·584	1·419	1·419	1·32	1·340
Stramonium Seed .	0·966	0·318	1·058	0·296	0·289	0·218	0·192	0·295
Veratrum Viride .	0·832	1·030	—	—	0·246	0·328	—	—

Conclusions.

1. Titration with volumetric acid solution is the best and most trustworthy method of assaying alkaloidal drugs.

* These figures all represent the percentage of alkaloids in the fluid extract, which in every case was taken from the same bottle for all the methods. The fluid extracts were of various makes.

† Alkaloidal residues were too deeply coloured to admit of being titrated.

‡ Not titrated because of the volatility of the coniine, it having been weighed as hydrochloride.

2. The gravimetric processes generally employed are often unsatisfactory and inaccurate.

3. Some of the methods employed are better adapted to some drugs than to others, as may be seen from the above table.

The Amount of Morphine in Extract of Poppy. B. H. Paul and A. J. Cownley. (*Pharm. Journ.*, 3rd series, xxiv. 521.) The following results were obtained by the authors in the analyses of five samples of this extract obtained from wholesale druggists :—

Sample	Morphine Per cent.
No. 1	0·72
„ 2	1·34
„ 3	1·61
„ 4	0·77
„ 5	1·14

A sample of extract made in the authors' laboratory according to the Pharmacopœia directions was found to contain 1·34 per cent. of morphine, and on the assumption that the whole of the alkaloid is extracted from poppy capsules by the treatment with water, the amount contained in the capsules, deprived of seeds, was 0·28 per cent. Merck gives the amount of morphine in poppy capsules as 0·12, which would correspond to the strength of the three samples of extract, Nos. 1, 4, and 5. In the case of samples 2 and 3, the proportion of morphine in the capsules from which they were prepared would have been more than double as much, and nearer to that present in the capsules used for making the laboratory sample.

In conclusion, it is pointed out that syrup of poppies, when made from capsules without reference to the amount of morphine they contain, is liable to be twice as strong in some instances as it is in others.

Assay of Extract of Conium. G. Liljenström. (*Pharm. Zeitung*, 1894, 57.) The author points out that a difficulty arises in this assay through the volatile nature of the alkaloid. He has ascertained that no matter how long the continuous extraction with ether of a mixture containing known quantities of coniine was continued, the total quantity of alkaloid could never be obtained. The alkaloid being volatile, it is carried along with the ether and travels continuously from the receiving flask to the percolator and back again. This tendency may be counteracted by placing in the flask a measured excess of centinormal acid, and then conducting the continuous extraction with ether in the

usual way. The entire amount of coniine used for the experiment could thus be recovered by an extraction occupying only fifteen to thirty minutes. The excess of acid is afterwards determined by titration with centinormal alkali, and the quantity of alkaloid calculated from the difference. This modification, applied to the assay of the extract, is regarded by the author as much more trustworthy than any of the processes in which ether solutions are allowed to evaporate in the condition in which they are obtained from alkaline solutions by shaking out with the volatile solvent.

Note on Extract of Aconite. F. Casson. (*Pharm. Journ.*, 3rd series, xxiv. 901.) The author has assayed six commercial samples of this extract with the following results:—

No.	Colour.	Consistence.	Moisture.	Ash.	Ether sol. Alkaloids.
1	Greenish-brown .	Fairly soft	24·6	15·0	·27
2	do. .	Very soft	28·8	16·0	·20
3	Brownish-green .	Fairly soft	19·8	19·4	·16
4	Brown	Hard	21·6	18·09	·28
5	Greenish-brown .	Very soft	28·7	14·6	·20
6	do. .	Fairly soft	27·18	15·5	·17

The table shows considerable variation in the proportion of alkaloid contained in these samples, and also appears to indicate a notable loss of alkaloid occurring in the process of preparing the extract, as the author shows by calculation from the average amount of base in the fresh herb that, if there were no loss, the extract should contain about ·8 per cent. instead of an average of 0·213 found in the above samples. It is further pointed out that, in the light of these results, a maximum dose of the tincture of aconite is more than three times as active as a maximum dose of the extract.

Estimation of Glycerin in Fluid Extracts. O. Linde. (*Pharm. Centralhalle*, 1894, 39; *Amer. Journ. Pharm.*, March, 1894.) 10 grams of the fluid extract are evaporated to 5 grams; the residue is dissolved in 50 c.c. of water, and solution of lead subacetate added drop by drop until the precipitation is complete. After the precipitate has subsided, the liquid is passed through a wet filter, the precipitate then transferred to the same filter and washed. The filtrate is acidified with a few drops of dilute sulphuric acid, mixed with a concentrated solution of phosphotungstic acid until precipitation ceases, and the mixture filtered and washed as before. The filtrate is rendered alkaline with sodium hydrate, evaporated

to the consistence of a syrup, the residue treated with 30 c.c. of a mixture of equal volumes of absolute alcohol and ether, the resulting solution evaporated in a tared long-necked flask, and dried till the weight is constant. The glycerin is thus left in an almost pure condition, contaminated with but a very small quantity of colouring matter.

Valuation of Pepsin. E. H. Bartley. (*American Druggist and Pharmaceutical Record*, October 5th, 1893.) The process suggested by the author is as follows:—

Solution No. 1.—Take the whites of several fresh eggs, mix them thoroughly, and to 100 grams of the mixed egg albumen add 900 c.c. of distilled water, or in this proportion if smaller quantities are used. Mix the solutions well, and boil from 3 to 5 minutes. After cooling, make up the mixture with water to the original volume. The liquid may be strained, if necessary, through fine muslin; but if the eggs are fresh only a slight coagulum will form during the boiling, and will yield a slightly opalescent liquid, containing 10 per cent. of white of egg. As the latter contains, on an average, about 12·2 per cent. of dry albumen, 100 c.c. of this liquid will contain 10 grams of egg-white, or 1·22 grams of dry albumen.

Solution No. 2.—Weigh out one gram of the pepsin to be tested, add to 25 c.c. of water, and then add 2 c.c. of diluted hydrochloric acid, U.S.P. Now add water enough to make the solution up to 50 c.c., or if it be a high-grade pepsin, make up to 100 c.c. after adding 4 c.c. of diluted acid.

Procedure.—Measure out into a beaker or bottle 50 c.c. of the albuminous liquid, and warm in a water-bath to 35° to 40° C. (95° to 104° F.). Now add to this solution 2 c.c. of diluted hydrochloric acid, U.S.P., and from one-half to five cubic centimetres of the pepsin solution. The more active the pepsin, the less the quantity to be taken. In the valuation of high-grade pepsins it is best to use 100 c.c. of albumen solution, containing 10 grams of egg-white, and 1 c.c. of pepsin solution containing 0·010 gram of pepsin. It may sometimes be necessary, with an unknown pepsin, to perform a preliminary test to determine the approximate time before spending too much time on an accurate test. It is best to so regulate the quantity of pepsin and albumen that the time shall be about two hours.

The time when the pepsin is added must be carefully noted, and the temperature of the solution must be kept between 35° and 40° C. (95° to 104° F.). At intervals of 10 minutes, after the first

hour, draw out a few drops of the solution with a nipple pipette (dropper), and float it upon a small quantity of pure nitric acid in a conical minim glass. The digestion is incomplete as long as a white zone of coagulated albumen appears at the line of contact of the two fluids. Note the time when the nitric acid ceases to give this coagulation. This end-reaction can generally be easily determined. In this manner three elements in the calculation of the digestive power of the pepsin are obtained, viz. :—

The weight of the egg-albumen, A.

The weight of the pepsin taken, P.

The time consumed, T.

As regards a standard time, the author fixes upon three hours as the average time of stomach digestion. The relation between the quantities of albumen and pepsin is expressed by the fraction $\frac{A}{P}$, *i.e.*, it is found by dividing the amount of albumen (5 grams in the above directions for weaker pepsins) by the amount of pepsin used when 1 c.c. of the solution above mentioned is taken for the test, viz., ·02 gram. This would give the amount of albumen digested by one part of pepsin in the observed time of the experiment as 250 grams. But the time is not the standard time. Assume that the time required for the digestion was 2 hours. The relation of this to the standard time, 3 hours, would be $\frac{3}{2}$. The above result must then be multiplied by this ratio in order to give the amount of albumen capable of being digested in the standard three hours. Expressed in the form of an algebraic equation we have: D (digestive power) $= \frac{A}{P} \times \frac{3}{T}$, and substituting the above values :—

$D = \frac{5}{0.2} \times \frac{3}{2} = \frac{15}{0.4} = 375$ grams, showing that 1 gram of this pepsin is capable of digesting 375 grams of egg-albumen in 3 hours, or 750 grams in 6 hours.

As egg-white contains about 12·2 per cent. of dry albumen, 1 gram of this pepsin will digest 45·75 grams of dry albumen in 3 hours, or 91·5 grams in 6 hours.

The advantages claimed for this process over the U.S.P. method are :—

1. The shorter time consumed.
2. Uniformity in results.
3. The avoidance of the necessity for shaking the solution during digestion.
4. A more exact statement of results.
5. The weaker solution of albumen used causes less interference with the action of the pepsin by the peptone formed.

Notes on Aloes and Iron Pills. W. F. Martin. (*Pharm. Journ.*, 3rd series, xxiv. 697.) The author points out that these pills can only be rolled out with difficulty, and that the quantity of confection of roses ordered in the Pharmacopœia is too small to make a satisfactory pill mass; also that the pills soon become hard and unsatisfactory on keeping. The following formula is stated to obviate these objections:—

Sulphate of iron	1½ parts.
Barbadoes aloes	2 „
Compound cinnamon powder . .	3 „
Glycerin of tragacanth . . .	1½ „
Confection of roses	1½ „

9½ parts of the above are equal to 10½ of the official pill mass. It therefore takes 109 grains instead of 120 to make 24 pills.

Linimentum Saponis. J. T. Hornblower. (*Pharm. Journ.*, 3rd series, xxiv. 900, 901.) The author suggests an improvement in the formula for the preparation of this liniment, consisting in the use of soft soap in place of the hard soap now required by the Pharmacopœia.

The Method of Preparing certain Ointments. P. Boa. (*Pharm. Journ.*, 3rd series, xxiv. 861–863.) The author points out that in some of the official ointments, such as simple ointment, resin ointment, and spermaceti ointment, the melted ingredients are directed to be stirred during the process of cooling, and that the effect of this constant stirring is to incorporate with the ointment a considerable quantity of air, which, not being sterilized previous to incorporation with the ointment, is calculated to lessen the stability of the product, and may become the means of conveying to a wounded surface septic organisms, whose invasion the application of the ointment is often designed to prevent. It is stated, moreover, that in certain skin diseases the exclusion of air from the affected part by the ointment is of great importance, and especially where disease-producing organisms are dependent for life on a supply of oxygen. The author has satisfied himself by experiments that there is no counterbalancing advantage to be gained by this process of stirring, and suggests that it should be given up. This simple modification in the process of preparing such ointments would ensure a saving of labour, and comparative freedom of the product from air, as well as greater stability and a more satisfactory appearance of the ointments.

The Oleates of the British Pharmacopœia. E. Williams. (*Pharm. Journ.*, 3rd series, xxiv. 696, 697.) The author regards

the official oleates as nothing better than solutions of the metal or oxide in impure oleic acid, and as being more or less of indefinite strength. He especially criticises the process for the preparation of oleate of mercury as very tedious and as yielding an unstable and unsatisfactory product. A suggested modification of the B.P. process is to place the mortar containing the weighed oleic acid in a pan of boiling water, and maintaining the heat until the temperature of the oleic acid is about 100° F., then dusting the oxide of mercury into it, and afterwards stirring until a solution is effected, which takes about fifteen minutes. A true oleate, however, should be made by precipitation and diluted as required. Suggestions in this direction are given in the original paper, to which the reader is referred for particulars.

NOTES AND FORMULÆ.

PART III.

NOTES AND FORMULÆ.

Mucilage for Mounting Plants in Herbaria. (From *Chemist and Druggist.*) Glycerin, 4½ parts; soft soap, 4½ parts. Dissolve 1½ parts of salicylic acid in 30 parts of alcohol; shake thoroughly, and add this mixture to a mucilage made of 139½ parts of gum arabic and about 270 parts of water. This mucilage remains elastic when dried, and has no tendency to crack. Use parts by weight.

Sterilization of Water for Domestic Purposes by means of Ferric Chloride. F. Watts. (*Chem. News*, lxviii. 178.) One to one and a half fluid ounces of the official liquor ferri perchlor. fort. is added to one hundred gallons of water, and if no precipitation occurs a small quantity of lime-water or solution of sodium carbonate is added, until a slight precipitate is formed. The mixture is vigorously stirred, allowed to settle over-night, and the clear water decanted or, if necessary, filtered the next morning.

Glacialin (Milk Preserving Powder). E. Dieterich. (From the author's *New Pharm. Manual.*)

Powdered boracic acid . . .	40 grams.
Sodium bi-carbonate . . .	60 „

Add one gram of this mixture to one quart of milk, then boil for quarter of an hour.

Decalcified Milk. A. E. Wright. (*Lancet*, 3647, 194.) Arthus and Pagès have observed that rennet coagulation in milk is delayed and the curds rendered less firm when the lime salts present are precipitated in an insoluble form, while the addition of soluble lime salts to milk accelerates this coagulation and increases the firmness of the clot. On the supposition that infantile dyspepsia is often due to the formation of rennet curds, the author proposes to delay or prevent this coagulation by the addition of one part of sodium citrate to 200 parts of the milk, which he finds to be

thoroughly efficient for the purpose intended. In cases where acid curds also contribute to dyspeptic troubles, he considers sodium bicarbonate or lime-water as indicated, which are calculated, on account of their alkalinity, to aid the digestion of milk by retarding rennet coagulation. He also points out that a mixture of lime-water and milk contains a somewhat smaller percentage of soluble lime than milk alone, since the latter is richer in lime than lime-water.

Somatose. F. Goldmann. (*Süddt. Apotheker Zeitung*, 1893, 529. From *Amer. Journ. Pharm.*) Somatose is a meat preparation containing large quantities of albumoses, with very little peptone; it is claimed to be more easily assimilated, and more agreeable, than the usual meat preparations containing a considerable proportion of peptones.

Solution of Quinine Sulphate for Hypodermic Use. M. Crouzel. (*Bull. de Pharm. de Bordeaux*, xxxiv. 130.) The author considers tartaric or citric acids as preferable to sulphuric acid for dissolving quinine sulphate intended for subcutaneous injections. The proportions recommended are 0·02 gram of tartaric or 0·06 gram of citric acid for 1 gram of quinine sulphate to be dissolved in 120 grams of distilled water.

Solution of Exalgin for Subcutaneous Injection. P. Cesaris. (*Boletl. Chim. farm.*, 1894, 69.) The author avails himself of the solubility of exalgin in a solution of sodium salicylate, and recommends a solution of 10 parts of the former and 11 parts of the latter in 100 parts of distilled water as well suited for hypodermic use.

Liquor Ammoniæ Ergotinatis. A. Voswinkel. (*Pharm. Zeitung*, 1894, 100.) The preparation referred to by the author is stated to be of such a strength that 1 c.c. represents 0·3 per cent. of ammonium ergotinate or 3 grams of ergot, and to possess the full activity of the drug, over which it is said to have the advantage of stability and uniformity of action. It is given in doses of 15–20 drops, and is also employed subcutaneously.

Mucilage of Sassafras Pith. J. W. England. (*Amer. Journ. Pharm.*, July, 1894.) This mucilage is best made by beating the pith, in a wedgwood or porcelain mortar, with a small quantity of *sterilized* water until it gets pasty, expressing through cloth, returning the residue to the mortar, adding more of the water, and continuing as before. This process is stated to yield a much more satisfactory product than maceration in water for several hours, and to be at the same time much more expeditious.

Granular Effervescent Preparations. A. Bradley. (*Western Druggist*, from *Proc. North Carolina Pharm. Assoc.*)

Effervescent Caffeine Citrate.

Caffeine citrate	gr. 20
Sodium bicarbonate	gr. 600
Citric acid	gr. 300
Tartaric acid	gr. 240
Sugar, powdered	gr. 620

Effervescent Caffeine Citrate and Phenacetin.

Caffeine citrate	gr. 20
Phenacetin	gr. 100
Sodium bicarbonate	gr. 600
Citric acid	gr. 300
Tartaric acid	gr. 240
Sugar, powdered	gr. 620

Effervescent Potassium Bromide.

Potassium bromide	tr. oz. ½
Sodium bicarbonate	tr. oz. 3¾
Tartaric acid	tr. oz. 1¼
Citric acid	tr. oz. 2

Effervescent Caffeine Citrate and Potassium Bromide.

Caffeine citrate	gr. 50
Potassium bromide	gr. 240
Sodium bicarbonate	tr. oz. 3¾
Tartaric acid	tr. oz. 1¼
Citric acid	tr. oz. 2

Effervescent Magnesium Sulphate.

Magnesium sulphate, dried	gr. 400
Tartaric acid	gr. 300
Citric acid	gr. 240
Sugar, powdered	gr. 460
Sodium bicarbonate	gr. 600

This is practically identical with some of the granular effervescent magnesium citrate of commerce.

Effervescent Vichy Salt.

Potassium bicarbonate	gr. 45
Sodium chloride	gr. 90
Magnesium sulphate	gr. 45
Sodium bicarbonate	tr. oz. 5
Tartaric acid	tr. oz. 1½
Citric acid	tr. oz. 2

Effervescent Pepsin.

Pure powdered pepsin	gr. 50
Citric acid	tr. gr. $1\frac{3}{4}$
Tartaric acid	tr. gr. $1\frac{1}{2}$
Sugar, powdered	tr. gr. $\frac{1}{2}$
Sodium bicarbonate	tr. gr. $3\frac{3}{4}$

Effervescent Pepsin and Bismuth.

Pure pepsin, powdered	gr. 50
Bismuth and ammonium citrate	gr. 50
Citric acid	tr. oz. $1\frac{1}{4}$
Tartaric acid	tr. oz. $1\frac{1}{3}$
Sugar, powdered	tr. oz. $\frac{1}{2}$
Sodium bicarbonate	tr. oz. $3\frac{3}{4}$

Sugar-Coating of Pills. (From *Chemist and Druggist.*) As a simple mode of sugar-coating, it is suggested to damp the pills with a mixture of 1 part of glycerin and 2 parts of spirit (both by weight), then to roll them in a mixture of 4 parts of sugar, 2 parts of tragacanth, and 1 part of starch.

Salol-Coating of Pills. G. Oeder. (*Pharm. Zeitung*, xxxviii. 527; *Pharm. Journ.*, 3rd series, xxiv. 225.) See also *Year-Book of Pharmacy*, 1893, 225. As suggested by the author, this operation is carried out in an enamelled sheet iron tray, upon the bottom of which some powdered salol is melted over a spirit lamp or gas flame. The pills are placed in the tray and rolled in the melted salol, sufficient heat being applied meanwhile to prevent solidification until the surfaces of the pills are coated with a thin layer. The heating is then discontinued and the rolling of the pills kept up for about one minute until they have sufficiently cooled. For thirty pills of average size the quantity of salol requisite is from a gram to a gram and a half; but if the pills are not sufficiently coated in one operation, the treatment must be repeated. The pills should have a uniform translucent coating, free from cracks or bare places, and the quantity of salol on each pill need not exceed two centigrams. The author states that he has succeeded in obtaining a sufficient coating with as little as five milligrams, and even in the case of the largest sized pills the salol coating need not exceed one decigram. In carrying out the operation, the chief point to be observed is to avoid heating too much, as that would have the effect of decomposing the salol. The low melting-point of salol (40° to 43° C.) facilitates the operation; and if that temperature is not exceeded, the substance may be repeatedly melted without undergoing alteration.

Creosote Pills. E. Dieterich. (*Pharm. Centralhalle*, 1893, 633; *Amer. Journ. Pharm.*, January, 1894.) 1 part of magnesia and 2 parts of glycerin are triturated, and 10 parts of creosote gradually added; the following substances are then incorporated in the order named: 5 parts of magnesia, 5 of powdered liquorice extract and a sufficient quantity of powdered liquorice root; the mass is divided into 100 pills. The pills, when pressed on a piece of white paper, do not produce an oily stain; immersed in water, they readily soften and disintegrate. *Tar pills* can be made by the above formula, substituting 10 parts of tar for the creosote.

Animal Charcoal as a Pill Excipient. E. Violé. (*Bull. de Pharm. de Bordeaux*, 1893, 142. From *Pharm. Journ.*) The author suggests that when creasote, croton oil, terpinol, essential oil, or other medicament difficult to combine, is to form an ingredient of pill masses, they may be prepared quickly and satisfactorily by employing animal charcoal as an absorbent. Thus, to dispense one gramme of creasote in twenty pills, it should be added to two grammes of charcoal in a mortar and quickly mixed so as to form a soft paste. More charcoal is then added, about half a gramme at a time, until a moist powder, not adhering to the pestle or mortar, results. Then, on adding a fifth to a fourth of a gramme of turpentine and kneading quickly, a perfectly homogeneous and plastic mass is obtained. Croton oil is said to make a good mass with the charcoal alone. More complicated formulæ may be similarly dealt with. For instance, if creasote is to be dispensed with tannin and iodoform, it should be blended with charcoal as when prescribed alone, the other ingredients next added and the whole intimately mixed, turpentine being then used to bind all together. Pills so prepared are said to be very small, whilst they have the disagreeable odour of the creasote masked to a great extent, and it is claimed that they may be rolled in magnesia, silvered, or coated with tolu. In dispensing similar medicaments in cachets, washed animal charcoal is also stated to be of value, five grammes serving to divide two grammes of creasote, whilst ten grammes serve for five of turpentine. It is urged that by the aid of this substance, the pharmacist can prepare and vouch for the exact dose and quality of the remedies in all the capsules, coated pills, etc., that he may require to dispense, and so avoid the necessity of purchasing them from wholesale manufacturers.

Administration of Sodium Phosphate as a Purgative. C. Paul. (*Journ. de Pharm. et de Chim.*, December, 1893.) The following

formula is recommended by the author in a communication to the *Soc. Thérap.*:—

Sodium phosphate	25 grams.
Distilled water	200 „
Simple syrup	60 „
Tincture of lemon	20 drops.

If an effervescent preparation be desired, 2 grams each of citric acid and sodium bicarbonate may be added to the foregoing formula.

Thioform, a Substitute for Iodoform. (*Pharm. Zeitung*, 1893, 426.) This preparation consists of basic dithiosalicylate of bismuth, and is recommended in the treatment of ulcers and diseases of the eye and skin.

Absorption of Guaiacol. G. Linossier and M. Lannois. (*Journ. de Pharm.* [5], xxix. 482.) Attention is called by the authors to the very rapid absorption of guaiacol by the skin. It can generally be detected in the urine a quarter of an hour after its application, and most of it is eliminated so rapidly that after 24 hours only traces of it are discoverable in the urine. There is, therefore, little risk of poisonous effects being produced unless it is applied in unnecessarily large quantity.

Guaiacol in Diabetes. M. Clemens. (*Wien. med. Prakt.*, 1894, No. 20.) The author speaks favourably of the action of guaiacol in the treatment of diabetes. The dose employed was from six to ten drops, three times a day, in a tablespoonful of milk or cod-liver oil.

Some New Remedies. (From *Chemist and Druggist.*) *Migränin.*— This is made by Meister, Lucius & Brünig, and is supposed to be a double citrate of antipyrin and caffeine, but there are doubts about the exact condition in which the various constituents of the compound exist therein.

Di-iodoform.—This new antiseptic was described at a recent meeting of the Paris Therapeutic Society. It is made by Adrian, and occurs in beautiful golden needle-shaped crystals, quite different from the scales of iodoform. Unlike iodoform, it is free from odour, and in practice has proved to be as good surgically. It is made by acting upon acetylene periodide with iodine.

Loretin is meta-iodo-ortho-quinoline sulphonate, and is proposed as an iodoform substitute. It is an acidulous substance, and combines with metallic bases. It closely resembles iodoform in appearance, but is odourless; for use as a dusting-powder it is recommended to be mixed with magnesia.

Antirheumatin.—This body consists of salicylate of sodium and methylene blue, and occurs in dark blue prismatic crystals, soluble in water and spirit, and having a slightly bitter taste. As its name implies, it is used in the treatment of acute rheumatism, the dose being $\frac{1}{10}$ to $\frac{1}{20}$ grain in pill form every two or three hours. It colours the urine green owing to oxidation of the methylene blue in passing through the body. Another remedy for the same disorder is

Tetraethylammonium Hydroxide.—It can be made by treating triethylamine with ethyl iodide; union results, and on treatment with silver oxide and water the iodine is replaced by O H, the resulting compound being $(C_2H_5)_4 \cdot N O H$. It is crystalline, bitter and acrid, strongly alkaline, absorbing $C O_2$ from the air, and readily splitting up into triethylamine, ethylene, and water. It has been given in Germany in 8 to 15 minim doses of a 10 per cent. solution, three or four times a day, or, hypodermically, in 8 minim doses of a 1 per cent. solution. The results are considered satisfactory.

Steresol. Dr. Blanc. (*Revue de Thérap.*, lx. 407.) According to the author, this preparation is obtained by dissolving equal quantities of gum lac, benzoin, and balsam of tolu in a sufficient quantity of alcohol, and adding ten per cent. of carbolic acid. It is an antiseptic varnish recently introduced by Prof. Berlioz for use in diphtheria and various skin diseases.

Nouv. Rem. gives the following formula for the same preparation:—

Gum lac	270 grams.
Benzoin	10 „
Balsam of tolu	10 „
Pure carbolic acid	180 „
Oil of cassia	6 „
Saccharin	6 „
Alcohol, sufficient to make one litre.	

Anti-Neuralgic Remedies. (From *Chemist and Druggist.*)

1.

Ammonii chloridi	ʒiij.
Tinct. gelsemii	ʒij.
Ext. glycyrrhiz. liq.	ʒss.
Aq. chloroformi ad	ʒvj.

Misce et filtra.

Sig.: One tablespoonful every four hours till the pain is relieved.

2.

Butyl-chloral hyd.	ʒj.
Ext. cocæ liq. (miscible)	ʒvj.
Glycerini	ʒij.
Tinct. aurantii	ʒij.
Aq. ad	℥vj.

M.

Sig.: One tablespoonful every four hours.

3.

Antipyrini	ʒij.
Tinct. cascaril.	ʒss.
Tinct. card. co.	ʒss.
Glycerini	ʒss.
Aq. ad	℥vj.

M.

Sig.: One tablespoonful every four hours.

4.

Exalgini	gr. xxiv.
Sacch. lact.	gr. xxiv.
Ess. menth. pip.	♏iij.

Misce bene et divide in partes duodecim.

Sig.: One powder every four hours.

5.

Phenacetin.	ʒj.
Quin. sulph.	ʒss.

Misce et divide in pulveres sex.

Sig.: One every four hours.

Cough-Mixtures. (From *Chemist and Druggist.*) The following is stated to be efficient for the distressing cough following a recent cold:—

Vin. ipecac.	℥ss.
Tr. camph. co.	℥ss.
Spt. chloroformi	ʒij.
Syrup. scillæ ad	℥ij.

M.

Dose: A teaspoonful every four hours.

For children above 4 years the prescription should be modified as follows:—

Vin. ipecac.	ʒij.
Tr. camph. co.	ʒij.
Spt. chloroformi	ʒj.
Syrup. tolutan.	℥ss.
Syrup. simpl. ad	℥ij.

M.

Dose: A half to a whole teaspoonful every three or four hours.

Tamarind Cough-Mixture. (From *Chemist and Druggist.*)

Syr. rhœad.	lb. iss.
„ scillæ	lb iss.
Ac. sulph. dil.	ʒiss.
Tr. camph. co.	ʒij.
Ol. amygd. ess.	ʒj.
Morph. acet.	gr. 18
Vin. antim. tart.	ʒij.
Aq.	ʒvj.

M.

Essence of Tamarinds. (From *Chemist and Druggist.*)

The following is a formula of the Berlin Apothecaries' Society:—

Purified tamarind-pulp	10 oz.
Alexandrian senna (previously extracted with rectified spirit)	1½ „
Boiling water	3 pints

Infuse for twelve hours, then strain, press the marc, and evaporate the strained liquor by boiling to a weight of 22 oz. Then take 14 fl. oz. of the residue and neutralize with solution of soda, and add—

Rectified spirit	ʒiv.
Simple syrup	ʒij.
Essence of vanilla	ʒiss.

Mix, add the rest of the evaporated liquor, set aside for about a week, and filter.

Palatable Emulsion of Castor Oil. M. Patein. (*Monit. Pharm.*, October, 1893.) An emulsion, in which the taste of the castor oil is well disguised, is obtained by the following formula:—

Castor oil Syrup of almonds Syrup of acacia	of each	30 grams.
Peppermint water		10 „
Distilled water		50 „

The castor oil is thoroughly well incorporated with the mixture of the two syrups, and the waters are then added by degrees, the mixture being well agitated after each addition.

Laxative Pills. M. Philippeau. (From *Journ. de Pharm. et de Chim.*)

Extract of cascara sagrada	¾ grain.
„ nux vomica	⅛ „
„ belladonna	⅙ „
Powdered ipecac.	⅛ „
Podophyllin	⅛ „

One pill to be taken at bedtime.

Tic Pills. (From *Chemist and Druggist.*)

Morphiæ acet.	gr. vj.
Cinchonidine	gr. 96
Ext. hyosc.	gr. 100
Pil. rhei co.	gr. 100

Div. in pil. 96.

Camomile Pills. (From *Chemist and Druggist.*)

Ext. anthem.	℥j.
Pil. coloc. co.	ʒij.
P. rhei	ʒij.
Ol. anthem.	♏viij.

Div. in iv. gr. pills.

Anti-Rickets Powder. (*Chemist and Druggist*, from *Berlin Hospitals Formulary.*)

Precipitated chalk	ʒiv.
Phosphate of calcium	ʒij.
Lactate of iron	ʒiij.
Sugar of milk	ʒvj. ʒij.

M.

A Remedy for Sea-Sickness. (*Chemist and Druggist*, from *Indian Medical Record.*) The following is stated to have proved very successful:—

Ext. hyoscyami	gr. ss.
Camphor	gr. j.
Asafœtidæ	gr. ss.

Ft. pil. One every four hours.

Snuffs for Coryza. (*Chemist and Druggist*, June 2nd, 1894.) At a recent meeting of the Paris Société de Thérapeutique, the following prescriptions for coryza were favourably discussed by members:—

1.

Betol, in fine powder	ʒiiss.
Menthol	gr. xv.
Cocaine	gr. vj.
Coffee	ʒiss.

Mix.

2.

Salicylate of bismuth	ʒvj.
Camphor	ʒiss.
Hydrochlorate of cocaine	gr. j.

Mix.

The following ointment is also useful for applying to the nostrils:—

Menthol	gr. j. to gr. iv.
Boric acid	ʒiss.
Vaseline	ʒx.

Mix.

Stomach Bitters. (From *Chemist and Druggist.*)

Gentian-root	ʒiv.
Bitter-orange peel	ʒiij.
Chiretta	ʒj.
Serpentary-root	ʒj.
Quassia	ʒss.
Cloves	ʒss.
Red sandalwood	ʒiij.
Glycerin	ʒiij.
Proof spirit	Oiv.

Crush all the solids to coarse powder. Macerate for ten days, and filter.

Tincture of Perchloride of Iron in Scalds and Burns. Dr. Starr. (*Amer. Drugg. and Pharm. Rec.*) The author states that where the cuticle is gone in scalds or burns, the official tincture, diluted with half to a third as much water, will, when applied immediately, not only allay pain, but prevent blisters. An ointment made of one part of the tincture of iron and eight parts of petrolatum or lard, constitutes, when spread on a soft cloth, a very useful dressing for old sores left by burns.

Cristalline. (*Répertoire de Pharm.* [3], v. 497.) This name is given to a solution of pyroxylin in methyl alcohol which is said to have various advantages over ordinary collodion, inasmuch as it evaporates more slowly, leaving a more durable and imperceptible pellicle, and is a good solvent of many external medicaments. "Elastic cristalline" is obtained by the addition of castor oil in the same proportion as used in the preparation of flexible collodion.

Iodized Collodion for Ringworm. M. Butte. (*Ann. de Derm. et de Syph.*, April, 1893, No. 4. From *Chemist and Druggist.*) The author strongly recommends the following for the treatment of ringworm:—

Rectified spirit	ʒiij.
Iodine	gr. x.

Dissolve and add:—

Collodion	ʒiss.
Venice turpentine	gr. xxiv.
Castor oil	ʒss.

Apply to the patch for three or four successive days till a thick

and adherent layer is formed. Remove in fifteen days, and wash in solution of mercuric chloride (1 in 500).

Charta Salicylica (Salicylic Paper). (From E. Dieterich's *New Pharm. Man.*)

Liquid paraffin	50 grammes.
Solid paraffin	50 „
Salicylic acid	1 „
Thin absorbent paper sufficient.	

Melt the paraffin together, rub up the acid well, and add it to the mixed hot paraffin, and in this mixture soak strips of thin white absorbent paper. This is useful for chafed feet.

Strips of this paper should be laid between the toes and over any chafed places on the feet. The feet must be washed daily with warm water, and fresh strips of the paper laid on.

Application for Enlarged Glands. (From *Medical Press.*)

Iodoformi	ʒj.
Bals. peruviani	ʒj.
Colodii	ʒj.

M.

To be painted over the swellings every night.

Application to Prevent the Stinging of Insects. M. Pednof. (*Pharm. Journ.*, from *Revue de Thérap.*) The author recommends for this purpose a concentrated solution of naphthalin in paraffin oil. A few drops are to be rubbed upon the exposed parts of the body. The application produces a temporary slight burning sensation, which soon passes off. The offensive smell of naphthalin would, however, be a probable objection in some instances.

Application for Insect Bites. (*Journ. de Pharm. et de Chim.*) An efficient application is said to be obtained as follows:—

Alcoholic solution of ammonia . .	3 parts.
Collodion	1 part.
Salicylic acid	0·1 „

One or two drops to be applied to each spot.

Resorbin, a New Ointment Base. (*Pharm. Centralhalle*, 1893, 688.) This preparation is obtained by incorporating a small quantity of wax with sweet oil of almonds by means of heat, and subsequently emulsifying the oil with a dilute aqueous solution of gelatin or soap.

Note on Superfatted Soap. J. R. Johnson. (*Pharm. Journ.*, 3rd series, xxiv. 1045.) Unna recommends, as being more easily absorbed than the ordinary pharmacopœial liniment of iodide of

potassium with soap, a liniment made from a 5 per cent. superfatted soap, prepared with benzoated lard and potash.

In endeavouring first of all to prepare a perfectly neutral soap, the author availed himself with success of the aid of calamel as an indicator, and found that, with the samples of benzoated lard and caustic potash at his disposal, actual neutrality was obtained with the following proportions:—

Benzoated lard	78·56 parts.
Caustic potash	21·44 „

With an additional 5 per cent. of lard to this neutral soap, the figures would therefore be:—

Benzoated lard . . .	79·56 parts.
Caustic potash	20·42 „

or for a convenient quantity—

Benzoated lard .	1 lb.
Caustic potash . .	4 ozs. 56 grains.

The last-named quantity of caustic potash is dissolved in 4 ounces of water, and the benzoated lard and this solution kept well stirred together over a water-bath for three or four days, to ensure perfect combination.

For the preparation of the liniment of iodide of potassium with this superfatted soap, the following formula is recommended as yielding a very satisfactory result:—

Of 5 per cent. superfatted soap as above prepared . . .	1 oz.
Iodide of potassium .	ʒiss.
Distilled water	fʒvi.

Dissolve the salt in the distilled water; warm the soap with about half of the solution in a porcelain dish over a steam or water-bath; gradually add the rest of the solution, and beat together with a spatula until cold. The product is described as a smooth, white, creamy liniment, much preferable for use to the present pharmacopœial preparation. The author adds that the strength of the liniment in the above formula is that suggested by Unna, but states that of course a liniment of any required strength may be as easily prepared, and oil of lemon or any other essential oil may be added if desired.

Alteration of Lanolin through Keeping. E. Dieterich. (*Pharm. Post*, 1893, 426.) The author calls attention to the observation that lanolin, when kept for several years, is liable to become

rancid, even when the bottle containing it is well corked. A purified and decolorized sample, which originally showed an acidity figure of 0·84, gave one of 17·86 after 6½ years.

Boro-Glyceride Lanolin. (From *Chemist and Druggist.*)

Boric acid	ʒv.
Glycerin	ʒiiss.
Distilled water	ʒiss.

Dissolve by the aid of heat and add to—

Anhydrous lanoline	ʒxj.
Olive oil	ʒiv.

Mix well.

Emollient Ointment. (From *Chemist and Druggist.*)

Vaselini	ʒviij.
Ceræ flavæ	ʒij.
Benzoini	ʒj.
Gum Thus	ʒij.
Tereb. venet.	ʒij.

Melt together over a water-bath, and strain through linen. Then add when sufficiently cool—

Camphor. pulv.	ʒj.
Ol. eucalypti glob.	ʒss.

Ointment for Nettle-Rash. (*L'Union Médicale*, and *Chemist and Druggist.*) The following ointment is stated to give excellent results in diminishing the itching, and producing a quiet sleep:—

Chloral	gr. x.
Powdered camphor	ʒj.
„ gum arabic	ʒj.
Simple cerate	ʒj.

Triturate the first three substances till liquefaction takes place, and then add the cerate. Apply to the affected area at night.

Ointment for Prurigo. Prof. Hebra. (*Rev. de Thérap. Méd.-Chir.*, November, 1893.) The ointment recommended for this purpose has the following composition:—

Sulphur	15 grams.
Oil of cade	15 „
Ordinary soft soap	30 „
Lard	30 „
Prepared chalk	10 „

Emollient Summer Lotion. (From *Chemist and Druggist.*)

Glycerini	ʒj.
Aquæ mellis.	ʒj.
„ lavand.	ʒiij.
„ flor. aurant.	ʒj.
„ flor. sambuci	ʒiv.
Otto rosæ	gtt. ij.
Spt. rectificat.	ʒss.

Dissolve the otto in the spirit, and mix with the rest of the ingredients in the order given.

Glycerin Suppositories. L. A. Harding. (*American Druggist.*) The author states that the following formula yields a very firm and perfectly transparent product, containing as much as 95 per cent. of glycerin:—

Stearic acid	2½ drachms.
Sodium carb.	1 dram. and 15 grains.
Glycerin	5 ounces.

Heat the glycerin and stearic acid together, regulating the temperature so as to just melt the stearic acid; when dissolved, stir so as to perfectly mix the mass, then add the carbonate of soda to the mixture, and when dissolved, pour into a suitable mould to cool. The product of the above formula should, if left to cool in the evaporating dish, present a perfectly transparent solid, and suppositories made from it should show the same physical characteristics. They will then contain about 95 per cent. of glycerin. Should the mass, however, upon cooling, present an opaque appearance, the fault may be looked for in two directions. In the first place, the amount of sodium carbonate may be deficient on account of the stearic acid of commerce. In this case, carbonate of sodium should be added. The necessity of adding carbonate of sodium may be recognised by the fact that the product is opaque in appearance, and soft to the touch, somewhat of the consistence of lard; the carbonate of sodium should be added, in small quantities at a time, until the desired result is obtained. Should, however, the product be opaque and very firm, glycerin is wanting, and should be added until a perfectly clear product results. The heat applied should not be any higher than is necessary to dissolve the stearin.

Solution of Creasote for Use as an Enema. M. Vizern. (*Journ. de Pharm.* [5], xxvii. 593.) The author suggests the use of almond oil soap of the French codex as an emulsifying agent in

the place of the tincture of quillaia recommended by P. Carles. He objects to the latter on the ground that the large quantities of this tincture required in some instances would contain a quantity of saponin, such as may possibly prove injurious to health. He also points out that the application of the tincture would lead to the injection of a somewhat large proportion of alcohol.

Solution of Mercuric Iodide in Olive Oil. J. Delacour. (*Journ. de Pharm. et de Chim.*, 1893, 603.) The olive oil intended for this preparation should first be purified by keeping it for several days in contact with nearly one-third of its volume of alcohol, and stirring the mixture frequently during that time. After decanting the alcohol the oil is sterilized at a temperature not exceeding 110–115° C. for a short time, and allowed to cool to about 65° C. Mercuric chloride is now added to the hot oil in the proportion of 0·4 gram for every 100 c.c. of the latter, and the mixture well stirred to effect complete solution. The product is filtered through sterilized cotton into sterilized bottles of yellow glass. It is stated to possess considerable stability.

Strong Solution of Salicylic Acid. M. Jaudon. (*Répertoire de Pharm.* [3], v. 341.) A solution containing 8 per cent. of this acid may be obtained by dissolving 8 grams in 24 grams of alcohol of 90 per cent., then mixing this with a solution of 4 grams of borax in 8 grams of pure glycerin, and adding sufficient water to make up 100 grams.

Note on Acidum Carbolicum Liquefactum, B.P. P. Boa. (*Pharm. Journ.*, 3rd series, xxiv. 511.) The author alludes to the difficulty of preventing crystallization in this preparation when made of the required strength. As an improvement in this respect he suggests that a portion of the water should be replaced by rectified spirit. 100 parts of carbolic acid, 7½ parts of water, and 2½ parts of rectified spirit give a liquefied carbolic acid that remains fluid in the shop bottle till the temperature falls to about 40° F. A larger proportion of spirit does not appear to serve the purpose better. When this liquefied acid containing 2½ parts of spirit in place of 2½ parts of water crystallizes, the resulting mass is less hard and much more easily re-liquefied than the mass which results on crystallization when water only has been used.

Crystallized Salol Camphor. H. Barnouvin. (*Répertoire de Pharm.* [3], v. 388.) An intimate mixture of one part of powdered camphor and nine parts of powdered salol is liquefied at a gentle heat, and allowed to crystallize. The crystals are dried on filtering paper and reduced to powder. This solid product is stated to

have various advantages over the liquid salol camphor described in the "Extra Pharmacopœia."

Benzoin-Alumina Cotton. G. Morpurgo. (*Pharm. Post*, 1893, 357.) This preparation is recommended as a hæmostatic in preference to ferric chloride cotton, as equally efficient and free from the objection of staining. It is made by boiling a solution of aluminium acetate with benzoin, straining, and immediately impregnating the cotton with it. The product is white, has a pleasant odour, and contains the benzoin in a finely divided condition.

Applications of Formaldehyde (Formic Aldehyde). J. Holfert. (*Pharm. Centralhalle*, xxxv. 225.) The author reports on the value of this substance in the preservation of vegetable products, the preservation of meat, and the destruction of putrid odours, and refers to its probable usefulness for producing pure cultures of yeast, on account of its power of killing bacteria and thus preventing putrefaction, without affecting fungi.

Formaldehyde (Formic Aldehyde) as an Antiseptic. M. Slater and S. Rideal. (*Lancet*, 3686, 1006.) The authors conclude, as the result of numerous experiments, that formaldehyde in solution and as a vapour possesses decided antiseptic properties, and suggest that its non-poisonous character, easy vaporization, and freedom from corrosive or other damaging action on fabrics, may render it useful for many purposes of practical disinfection. The results of their experiments fully confirm the conclusions of Trillat (*Year-Book of Pharmacy*, 1893, 180) and others, as to the efficiency of formaldehyde as an antiseptic and sterilizing agent, the power of inhibiting the growth of micro-organisms being possessed by it in a high degree. The microbicide power of the vapour of the compound is also found to be very marked.

Cause of the Deodorizing Action of Formalin. E. Schmidt. (*Pharm. Zeitung*, 39, 56; *Pharm. Journ.*, 3rd series, xxiv. 963.) The author has observed that on adding formalin to putrified meat-broth the offensive odour immediately disappears. The same effect is produced on adding formalin to putrid urine. The smell of fæces is also destroyed by formalin. Further inquiry as to the chemical nature of the change thus produced showed that when a solution of sulphuretted hydrogen is shaken with a sufficient quantity of formalin, the odour of the gas disappears and is replaced by a faint alliaceous smell, and it is suggested that the reaction taking place may be represented by the following equation :—

$$CH_2 \cdot O + H_2S = CH_2 < \begin{matrix} SH \\ OH \end{matrix}$$

or when there is sufficient excess of formalin to remove the mercaptan smell:—

$$\left.\begin{matrix} CH_2 < \begin{matrix} SH \\ OH \end{matrix} \\ CH_2 \cdot O \end{matrix}\right\} = CH_2 < \begin{matrix} S \\ OH \end{matrix} \begin{matrix} \\ OH \end{matrix} > CH_2.$$

Methylmercaptan, $CH_3 \cdot SH$, which is, according to Nencki, the chief cause of the odour of fæces, is rapidly decomposed by an excess of formalin. Ammonia and ammonia bases are immediately converted into inodorous products. Skatol is not acted upon by formalin unless hydrochloric acid is added, and then it is converted into an odourless product insoluble in water. In this respect synthetic skatol differs from its isomer methylindol, which is immediately acted upon by formalin.

Paraform. M. Aronsohn. (*L'Union Pharmaceutique*, xxxv. 165.) This name is applied by the author to polymerized formic aldehyde, which is proposed for use as an intestinal antiseptic. It is described as a white crystalline, insoluble and non-poisonous substance, which can be taken in doses up to 5 grams without producing any injurious effects. In its germicidal action it is stated to be greatly superior to β-naphthol, especially in its action on the bacillus of typhoid fever. It is also said to be well suited for the sterilization of urine.

Bismuth Compounds of Tribromophenol and Beta-Naphthol as Intestinal Antiseptics. F. Hueppe. (*Pharm. Post*, 1893, 221.) Tribromophenol-bismuth, containing 49·5 per cent. of bismuth oxide, is regarded by the author as a most valuable remedy in cholera, and is described as an insoluble, non-poisonous, odourless, and tasteless yellow powder, free from all irritating effects. It is given in frequently repeated doses of 0·5 gram, and up to 5 grams daily. Beta-naphthol-bismuth containing 80 per cent. of bismuth oxide is also recommended as an efficient internal antiseptic in cholera and diarrhœa, and is administered in daily quantities of 1 to 2 grams. It is a neutral, odourless, brown powder soluble in water. Both preparations are stated to be much superior to beta-naphthol, salol, or sozoiodol.

Tricresol. (*Pharm. Journ.*, 3rd series, xxiv. 776.) Under this name a purified mixture of ortho-, meta-, and para-cresol has been introduced for surgical purposes. It is a clear, colourless liquid, having an odour like creasote, and boiling between 185° and 205°. The specific gravity is from 1·042 to 1·049 at 20° C., and it is said to be almost, if not entirely, free from phenol. The purification of this product from neutral hydrocarbons has been carried out so

that the purified product will dissolve in water to the extent of from 2·2 to 2·5 per cent., which is amply sufficient for its application in surgical practice, for which purpose a solution containing from 0·5 to 1·0 per cent. is strong enough on account of the great disinfecting power of the cresols. By means of this purification it is thought that the necessity for adding emulsifying agents to cresol in order to obtain sufficiently strong solutions will be avoided. Gruber's determinations of the solubility of cresols in water gave the following results:—

	Per cent
Orthocresol	2·50
Metacresol	0·53
Paracresol	1·80
Mixed cresols from toluidine	2·20
„ „ „ tar oil	2·55

Cresol Solutions as Antiseptics. H. Nördlinger. (*Apothcker Zeitung, Pharm. Journ.*, 3rd series, xxiv. 940.) The author refers to the various preparations of this kind which have been introduced as antiseptics and disinfectants. The latest of these is "tricresol," which is represented as being a natural mixture of the three cresols (ortho-, meta-, and para-cresol) of constant composition (see preceding abstract). It is now shown, however, that it also contains from 4 to 9 per cent. of phenol. The author has introduced a purer form of unmixed cresol free from phenol under the name pure liquid cresol. He describes it as the hydrate of orthocresol, $C_6 H_4 C H_3 \cdot O H + H_2 O$, bearing the same relation to the crystalline orthocresol that liquefied phenol has to the crystalline substance. The reasons for giving preference to orthocresol as compared with meta- or paracresol are the following:—

The slight differences in the disinfecting power of 4 per cent. solutions of the different cresol sulphonic acids observed by Frankel are scarcely recognisable with water solutions containing 0·5 to 2 per cent. of the several cresols. The relative disinfecting power was not, therefore, of so much importance in regard to the selection of one or other of the three cresols as their chemical, physical, and economic relations. Orthocresol has important advantages over the other two forms of this substance. It is more soluble in water, less corrosive, and less poisonous. Moreover, it can be produced with ease in large quantities, and supplied at a much lower price than the other forms of cresols. As it is solid below 30° C., it is supplied for use in the hydrated liquid state as a colourless clear liquid, which gradually becomes reddish on exposure to light. The specific gravity is 1·06. It does not solidify

above 10° C., has an agreeable odour, is soluble in alcohol or ether in all proportions, forms a clear solution with 33 parts of water, and is readily soluble in alkalies.

Orthocresol gives a reaction with ammonia, which serves to distinguish it from the other forms of cresols. When a few drops are mixed with a few c.c. of ammonia solution and shaken, the liquid becomes bluish on standing, like dilute solution of cupric sulphate; but after some days it acquires a deep indigo blue colour, and becomes opaque. Paracresol treated in the same manner gives a transparent liquid of a pale yellow colour. Metacresol also gives a transparent liquid, which has at first a faint steel blue colour, afterwards becoming bluish, but distinguishable from the deep indigo blue produced with orthocresol.

Phenated Lime. (*Moniteur de la Pharm.*, from *Journ. de Chir. d'Anvers.*) 3 parts of quick-lime are carefully slaked with 6 parts of water, and 2 parts of gas tar are then added in small portions at a time until thoroughly incorporated. The product is used as a disinfectant, and is mixed for this purpose with a suitable quantity of water.

Influence of Solvents on Germicides. P. Lenti. (*L'Union Pharm.*, xxxv. 58.) The author's observations indicate that alcohol, glycerin, and fatty substances are unsuitable ingredients of liquid disinfectants, as they seem to impede the germicidal action of mercuric chloride, carbolic acid, and several other disinfectants.

The Antiseptic Action of some Essential Oils. M. Lucas-Championnière. (*Rev. Thérap.*, 1893, 290.) *Oil of cinnamon* is considered by the author as superior even to corrosive sublimate as an antiseptic. The *oils of verbena and geranium* have an analogous action. All these oils are easily absorbed and readily eliminated by the urine.

Deodorized Alcohol for Perfumes. (From *Chemist and Druggist.*)

Spirit	1 gallon.
Powdered quicklime	4 drs.
„ alum	2 drs.
Sweet spirit of nitre	1 dr.

Mix the lime and alum, add the alcohol, shake well, and add the spirit of nitre. Set aside for a week, and filter through animal charcoal.

Extraction of Perfumes from Flowers. G. Morpurgo. (*Pharm. Post*, 1893, 405.) A series of boxes containing the odorous material are alternately connected with Woulff's bottles partly

filled with purified vaseline oil. Air, partly freed from oxygen by passing it through an alkaline solution of pyrogallol, is then drawn by means of an air-pump through the entire apparatus for some time, after which the flowers are removed and replaced by fresh quantities. Subsequently the essential oil is extracted from the mineral oil by means of deodorized alcohol.

Armenian Perfume Paper. (*Chemist and Druggist*, August 12th, 1893.) A superior perfume paper may be made from either of the following tinctures:—

A.

Benzoin	ʒvj.
Myrrh	gr. xxxvj.
Orris in coarse powder	ʒiss.
Musk	ʒss.
Otto of rose	mij.
Rectified spirit	ʒiv.

Macerate for a day, then percolate to make 3 oz.

B.

Benzoin	ʒiiss.
Balsam of tolu	ʒv.
Storax	ʒv.
Sandalwood	ʒv.
Cascarilla	ʒv.
Myrrh	ʒiiss.
Musk	gr. xv.
Rectified spirit	ʒx.

Macerate and percolate as above.

Unsized paper is first dipped in a cold saturated solution of nitre, then dried and dipped in either of the tinctures.

Queen-of-the-Night Bouquet (From *Chemist and Druggist.*)

Extract of jasmine	21 oz.
„ violets	25 „
„ rose	14½ „
„ reseda	4½ „
„ jonquil	4½ „
„ orange	2¼ „
Musk	4 grs.
Essence of civet	ʒix.
„ vanilla	ʒvij.
„ ylang-ylang	ʒiiss.
Oil of cedar-wood	ʒss.
„ cloves	mxx.
„ geranium	mx.
Absolute alcohol	ʒx.

Mix.

Toilet Applications. (E. Dieterich's new Pharmaceutical Manual. From *Amer. Drugg. and Pharm. Record.*)

Cocoa-butter Milk.

Powdered borax	ʒiiss.
„ Castile soap	ʒiv.
„ cocoa butter	℥iss.
Cocoanut oil	ʒiv.
Water	℥ij.

Rub together in a warm mortar for ten minutes, then dilute very gradually with—

Rose-water at 40° C.	℥xxvj.

Shake the mixture well, and perfume with—

Oil of bergamot	gtt. xx.
„ neroli	gtt. v.
„ orris	gtt. j.
Vanilla sugar	ʒiiss.

Previously rubbed together.

Cocoa Milk.

Powdered borax	ʒiiss.
„ Castile soap	ʒv.
Cocoanut oil	℥ij. ʒij.
Water	℥ij.
Rose-water at 40° C.	℥xxvj.
Oil of bergamot	gtt. x.
„ neroli	gtt. v.
„ wintergreen	gtt. ij.
„ ylang-ylang	gtt. j.
„ bitter almonds	gtt. j.

Prepare in the same manner as cocoa-butter milk.

Lanolin Milk.

Powdered borax	ʒiiss.
„ Castile soap	ʒv.
Water	℥iiss.
Cocoanut oil	℥j.
Lanolin	℥iiss.
Rose-water at 40° C.	℥xxv.
Oil of bergamot	gtt. x.
„ neroli	gtt. x.
Otto of rose	gtt. v.
Oil of wintergreen	gtt. j.
„ orris	gtt. j.

Prepare in the same manner as cocoa-butter milk.

Improved Cold Cream. (*Chemist and Druggist*, August 12th, 1893.)

Spermaceti	ʒij.
White wax	ʒj.
Oil of almonds	ʒiv.
Glycerin	ʒij.
White vaseline	ʒvj.
Boric acid	ʒij.
Oil of rose-geranium	ɱl.
„ lemon	ɱl.
„ bergamot	ʒj.
„ cassia	ɱxx.
„ neroli	ɱxij.
„ rose	ɱiv.

Melt at a low heat, stirring well, and when cold add the essential oils.

This cream contains no water.

Perfumed Naphthalin Camphor. (From *Chemist and Druggist.*)

Naphthalin	84 oz.
Camphor	28 „
Coumarin	ʒss.
Nerolin	gr. xv.
Nitrobenzol	ʒiij.

Mix.

Macassar Hair Oil and Macassar Pomade. R. Glenk. (*Amer. Journ. Pharm.*, November, 1893.) The following formula is recommended for preparing a so-called macassar oil for the hair :—

℞	Castor oil	16 fl. oz.
	Alcohol	3 fl. oz.
	Oil of nutmeg	30 ɱ
	„ rosemary	10 ɱ
	„ sweet marjoram	10 ɱ
	„ neroli	10 ɱ
	„ rose	20 ɱ
	Tincture of musk	1 fl. dr.
	Alkanet	sufficient to colour.

Macassar Pomade. This, made by the following formula, is stated to yield an excellent preparation :—

℞	Castor oil	10 oz. weight.
	Suet	2 „
	Spermaceti	1 „
	Oil of nutmegs	½ fl. dr.
	„ sweet marjoram	½ fl. dr.
	„ rosemary	½ fl. dr.
	„ rose	15 ɱ
	„ rose-geranium	10 ɱ
	Alkanet root	sufficient to colour.

Melt the spermaceti and suet, and then add the castor oil previously coloured by digesting with alkanet, and after cooling add the perfumes.

Preparations for the Hair. (From *Chemist and Druggist.*)

Citron Cream.

1.

Ceræ albæ	ʒx.
Ol. amygdalæ	ʒivss.
„ ricini	ʒv.
„ olivæ	ʒxiiss.

Melt by the heat of a water-bath.

2.

Ol. limonis	ʒv.
„ amygdal. essent.	ɱxij.
Acid. benzoic.	ʒj.
Cambogiæ	ʒj.
Spt. rectificat.	ʒj.

Dissolve the gamboge in the spirit, filter, and mix the oils and acid with the filtrate.

Add No. 2 to No. 1 in small quantities at a time, shaking well. Next add the following, assiduously shaking :—

Acid. citric.	ʒiss.
Aquæ destillat.	ʒv.
Glycerini	ʒv.

Cantharidin Hair-stimulant.

Cantharidin	gr. v.
Acetic ether	ʒiij.
Glycerin to	ʒj.

Reduce the cantharidin to powder, and shake with the ether; then add the glycerin. Separately prepare the following mixture :—

Oil of rose-geranium	ʒss.
„ eucalyptus	ʒss.
„ rosemary	ʒss.
„ bergamot	ɱxx.
Powdered borax	ʒvj.
Camphor water	Oij.
Distilled water	Oij.

Triturate the oils with the borax; add the waters, and allow to stand for a fortnight, shaking daily. Then add the cantharidin solution, and filter through powdered pumice (about 1 oz.), which should be shaken with the mixture before filtration.

Rosemary Hair-wash Powder.

Pulv. quillaiæ	℈j.
„ boracis	ʒij.
„ camphoræ	gr. x.
Ol. rosemarinæ	♏iij.

M.

The above is sufficient for a wine-bottle of water.

Superior Hair-pomade.

Italian castor oil	ʒxvj.
Olive oil	ʒxij.
Jasmine pomade	ʒxx.
Violet pomade	ʒxx.

Melt the pomades with a gentle heat, and stir in the oils.

The floral pomades are to be used. If a thicker consistence be desired, 2 ounces of the purest yellow wax should be added to the formula.

Formulæ for Pomades. (From *Chemist and Druggist.*)

Soxhlet recommends the following formula for a pomade-base, which is said to prove very satisfactory :—

	Parts.
Lard	300
Hard paraffin	20
White wax	10

Melt and stir until cold.

For yellow pomade yellow wax may be employed, with the addition of palm oil to colour. A small quantity of alkanet gives a rose colour. A green hue may be obtained by the addition of chlorophyll in the shape of spinach or grass digested in the hot fat. The following mixture is a suitable perfume :—

	Parts.
Oil of bergamot	10
„ lemon	5
„ clove	1
„ cinnamon	½
„ thyme	¼
Otto of rose	5

Mix.

A good basis for pomades generally is obtained by means of the following recipe :—

Benzoated lard	ʒiv.
White wax	ʒj.
Oil of bergamot	♏xv.
„ citronella	♏xij.
Otto of rose	♏iv.

Rose Pomade.

Lard	ʒx.
White wax	ʒiij.
Otto of rose	♏xv.
Alkanin	gr. iv.

Heliotrope Pomade.

Lard	ʒx.
White wax	ʒiij.
Heliotropin	gr. iij.
Oil of neroli	♏ij.

Violet Pomade.

Pomade basis	ʒxx.
Jasmine oil (floral)	ʒij.
White wax	ʒiv.
Coumarin	gr. ss.
Heliotropin	gr. ij.
Otto of rose	♏iv.
Oil of orris	♏ij.
„ bergamot	♏ij.
Alkanin	gr. ij.

The following perfume is also suitable in place of the above:

Oil of bergamot	ʒss.
„ lavender	ʒss.
„ lemon	♏xv.
„ cinnamon	♏ij.
„ bitter almonds	♏j.
Coumarin	gr. ss.

Peruvian Pomade.

Lard	ʒviij.
White wax	ʒij.
Liquid extract of cinchona	ʒss.
Otto of rose	♏v.
Oil of lemon	♏xij.

Lanolin Pomade.

Lanolin	ʒx.
Cocoa-nut oil	ʒj.
Benzoic acid	ʒss.
Essence of raspberry	ʒss.
Oil of cinnamon	♏iv.
„ citronella	♏viij.
„ rose-geranium	♏v.
„ bergamot	♏viij.
Peruvian balsam	♏x.

Apple Pomade.

Pomade basis	ʒxv.
Acetic ether	ʒj.
Oil of peppermint	mxv.
Oil of lemon	mx.
Oil-soluble chlorophyll	gr. viij.
Tincture of curcuma	mx.

Shampoo-Liquids. G. H. Dubelle. (From *Pharm. Record.*)

Elite Shampoo.

Hungary water	ʒxvj.
Bay rum	ʒviij.
Tincture of quillaia	ʒiv.
Rosemary-water	ʒiv.
Glycerin	ʒij.
Carbonate of ammonia	ʒj.
Borax	ʒj.
Tincture of cantharides	ʒj.

Mix.

To the rosemary-water, in which the borax and carbonate of ammonia have been dissolved, add the rest of the ingredients, and mix thoroughly by agitation. The hair is moistened with the liquid, and rubbed vigorously to produce a copious lather.

Salicyline Shampoo.

Rosemary-water	ʒxviij.
Rose-water	ʒviij.
Bay rum	ʒvj.
Carbonate of ammonia	ʒss.
Carbonate of soda	ʒss.
Salicylic acid	ϑiiss.

Mix.

Prepare and use as the preceding.

Tonic Shampoo.

Tincture of quillaia	ʒx.
Eau de Cologne	ʒiv.
Glycerin	ʒiij.
Fluid extract of jaborandi	ʒiv.
Sulphate of quinine	ʒss.
Orange-flower water enough to make	ʒxxxij.

Mix.

Dissolve the quinine in the eau de Cologne and tincture of quillaia with the aid of heat; then add the remaining ingredients, and filter if necessary.

Dental Preparations. (From *Chemist and Druggist.*)

Dental Tincture.

Tannin	ʒij.
Extract of rose	ʒss.
Tincture of orange-peel	ʒss.
Cochineal colouring	ʒij.
Camphor water to	ʒxx

Mix and filter after an hour.

This is stated to be a simple and effective preparation for spongy gums, etc. It is to be used frequently when the mouth is very sore, or morning and evening as a preventive. A dessert-spoonful in a wineglassful of warm water is the quantity for use.

Alkaline Mouth-wash.

Sodæ bicarbonatis	ʒiss.
Ammoniæ carbonatis	gr. vj.
Tinct. myrrhæ	ɱxv.
Aq. coloniensis	ʒiij.
„ lavandulæ	ʒj.
„ destillat. ad	ʒvj.

Mix and filter.

To be used with an equal bulk of warm water.

Tooth and Gum Tincture.

Acid. boric.	ʒss.
Tr. krameriæ	ʒj.
Aq. coloniensis	ʒxx.
Tr. myrrhæ	ʒxx.

Mix.

Court Dentifrice.

Precipitated chalk	60 oz.
Carmine	ʒij.
Otto of rose	ɱl.
Oil of pimento	ɱl.
„ cloves	ɱl.
„ cinnamon	ɱxx.
„ lemon	ɱxx.
Grain musk	gr. x.

Triturate the musk with the carmine and ½ oz. of chalk for five minutes; then add the oils one by one with about 2 drachms of chalk along with each oil. Continue trituration for at least ten minutes with half the chalk; add the rest, and sift three times.

White-rose Saponaceous Dentifrice.

Powdered white Castile soap	ʒiv.
„ orris root	ʒiv.
Heavy carbonate of magnesia	ʒviij.
Precipitated chalk	ʒxvj.
Otto of rose	ʒss.

Triturate the otto with 1 oz. of the chalk before adding the rest of the powders; then sift three times.

Foaming Carbolic Dentifrice.

Quillaia, in coarse powder	ʒiv.
Glycerin	ʒiij.
Rectified spirit	ʒv.

Macerate for four days, and add—

Carbolic acid, in crystals	ʒj.
Oil of rose-geranium	ɱx.
„ cloves	ɱx.
Otto of rose	ɱx.
Oil of cinnamon	ɱx.
Tincture of rhatany	ʒiss.
Rose-water	ʒxxx.

Macerate for another four days, and filter.

Compound Charcoal Dentifrice.

Cretæ precip.	ʒviij.
Pulv. saponis hispan. alb.	ʒij.
„ oss. sepiæ	ʒiij.
„ magnes. carb. pond.	ʒiij.
„ ligni carbon.	ʒxij.
Acid. benzoic.	ʒij.
„ boric.	ʒx.
Ol. neroli	gtt. xij.
„ caryoph.	gtt. xx.
„ amygd. amar.	gtt. vj.
„ bergamot.	ʒj.
Otto rosæ	gtt. vij.

This is recommended as a valuable antiseptic powder for the teeth and gums.

Menthol Dentifrice. (*Rép. de Pharm.*, 1893, 413.)

The following formula is recommended:—

Flowers of sulphur	25 parts.
Magnesium carbonate	25 „
Menthol	1 part.
Cochineal	0·5 „
Glycerin	a sufficient quantity.

Gilding-Powder. J. C. Martin. (From *Chemist and Druggist.*) For gilding metals such as copper and silver the following powder is stated to give good results:—

	Parts.
Gold chloride	20
Potassium cyanide	60
Cream of tartar	5
Precipitated chalk	100

Before using, the powder is to be mixed with 100 parts of water, and rubbed upon the metal with a pad of cotton wool.

Baking-Powders. (From *Chemist and Druggist.*)

No. 1.

Tartaric acid, powdered and dried	1 lb.
Bicarbonate of soda, dried	21 ozs.
Rice flour	3 lbs. 2 ozs.

Mix.

No. 2.

Cream of tartar	2 lbs.
Bicarbonate of soda	1 lb.
Wheaten starch	1 „

Mix.

One teaspoonful of either to 1 lb. of flour.

Flash Powder. (*Amer. Drugg. and Pharm. Record*, from E. Dieterich's *New Pharm. Man.*) Flash powders serve for theatrical purposes, and are also particularly valuable as a source of light for instantaneous photography. Since the mixtures explode on concussion, the materials should be mixed immediately before being used, by means of a piece of card or paper. Small capsules can also be made of from one-half to two grammes (7 to 30 grains) capacity, paper saturated with nitrate of soda or potash being used as an envelope for the capsule or cartridge. When this is done, it is only necessary to apply a match to the exterior of the cartridge to set it off.

The two following formulæ are stated to yield very satisfactory preparations:—

	Grammes.	
(*a*) Potassium permanganate in number 50 powder	40	(617 grains).
Magnesium, number 30 powder	60	(926 grains).
(*b*) Aluminium in number 30 powder	30	(462 grains).
Antimony sulphide in number 30 powder	15	(232 grains).
Potassium chlorate in number 20 powder	65	(1,080 grains).

Brown Floor-Stain. (From *Chemist and Druggist.*)

Glue	1 lb.
Water	1 gallon.
Bichromate of potash	½ oz.
Water-soluble aniline brown	1½ „

Soften the glue in the water, and dissolve by the aid of heat. Dissolve the other ingredients in ½ pint of water, and add this to the glue solution. Apply hot, and when dry, varnish,

Varnishes. (*Amer. Drugg. and Pharm. Record.*)

Celluloid Varnish.

	Parts by weight.
Pyroxylin (soluble gun cotton)	5
Ether	47
Alcohol, 95 per cent.	45
Camphor	3

Pour the ether over the pyroxylin, add the alcohol, and finally the camphor.

This varnish may be coloured by the addition of anilines. It is particularly adapted for covering paper labels.

Russian Furniture Varnish.

	Parts by weight.
Shellac	200
Rosin	18
Absolute alcohol	500
Turpentine	40
Powdered talc	30

Warm the shellac and rosin, add the absolute alcohol, and finally the turpentine and talc. Shake for several minutes vigorously, and allow to stand in a cool place. After eight days pass through a filter which has been previously wetted with alcohol.

Leather Varnishes. (*American Druggist*, June 28th, 1894.)

Yellow.

	Parts.
Shellac, light	50
Sandarac	50
Mastic	50
Larch turpentine	20
Castor oil	5
Oxalic acid	5
Alcohol	sufficient to make 1,000

Dissolve the solid in 825 parts of alcohol by maceration, filter

and add sufficient 90 per cent. alcohol to bring the whole up to 1,000 parts by weight.

Yellow leather varnish is useful for painting yellow leather harness and fittings. If the harness has been used, it should be cleaned with benzin before the dressing is applied; the oxalic acid intensifies the yellow colour. By vigorous rubbing a polish is obtained.

Red Russia-Leather Varnish.

	Parts.
Sandarac	100
Mastic	50
Larch turpentine	20
Elenic (soft)	5
Castor oil	5
Birch tar oil	10
Fuchsin	5
Alcohol, 90 per cent., sufficient to make	1,000

Dissolve the gums and the castor oil in 8·50 parts of alcohol by maceration, and then add the birch oil and the fuchsin, and finally sufficient alcohol to make 1,000 parts.

The above may be applied to yellow leather which has previously been deprived of grease by means of benzin, with a view to imitating Russia-leather.

Dead Black Leather Varnish.

	Parts.
Shellac, brown	200
Soap shavings	40
Larch turpentine	20
Yellow wax	20
Nigrosin, soluble in alcohol	10
Lampblack	10
Alcohol, 95 per cent., sufficient to make	1,000

Dissolve the soap, wax and rosin in 800 parts of alcohol by maceration at 70° C., add the nigrosin to the hot solution, allow to cool, and strain through gauze. Rub the lampblack up well with a small quantity of the solution, and then add this to the whole. Finally add sufficient alcohol to make up to 1,000 parts.

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TRANSACTIONS

OF THE

British Pharmaceutical Conference

AT THE

THIRTY-FIRST ANNUAL MEETING

AT

OXFORD

1894.

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British Pharmaceutical Conference.

CONSTITUTION.

Art. I.—This Association shall be called The British Pharmaceutical Conference, and its objects shall be the following :—

1. **To hold an annual Conference of those engaged in the practice, or interested in the advancement, of Pharmacy, with the view of promoting their friendly reunion, and increasing their facilities for the cultivation of Pharmaceutical Science.**
2. **To determine what questions in Pharmaceutical Science require investigation, and when practicable, to allot them to individuals or committees to report thereon.**
3. **To maintain uncompromisingly the principle of purity in Medicine.**
4. **To form a bond of union amongst the various associations established for the advancement of Pharmacy, by receiving from them delegates to the annual Conference.**

Art. II.—Membership in the Conference shall not be considered as conferring any guarantee of professional competency.

RULES.

1. Any person desiring to become a member of the Conference shall be nominated in writing by a member, and be balloted for at a general meeting of the members, two-thirds of the votes given being needful for his election. If the application be made during the recess, the Executive Committee may elect the candidate by a unanimous vote.

2. The subscription shall be 7s. 6d. annually, which shall be due in advance upon July 1.

3. Any member whose subscription shall be more than two years in arrear, after written application, shall be liable to be removed from the list by the Executive Committee. Members may be expelled for improper conduct by a majority of three-fourths of those voting at a general meeting, provided that fourteen days' notice of such intention of expulsion has been sent by the Secretaries to each member of the Conference.

4. Every association established for the advancement of Pharmacy shall, during its recognition by the Conference, be entitled to send delegates to the annual meeting.

5. The Officers of the Conference shall be a President, four Vice-presidents by election, the past Presidents (who shall be Vice-presidents), a Treasurer, two General Secretaries, one local Secretary, and nine other members, who shall collectively constitute the Executive Committee. Three members of the Executive Committee to retire annually by ballot, the remainder being eligible for re-election. They shall be elected at each annual meeting, by ballot of those present.

6. At each Conference it shall be determined at what place and time to hold that of the next year.

7. Two members shall be elected by the Conference to audit the Treasurer's accounts, such audited accounts to be presented annually.

8. The Executive Committee shall present a report of proceedings annually.

9. These rules shall not be altered except at an annual meeting of the members.

10. Reports on subjects entrusted to individuals or committees for investigation shall be presented to a future meeting of the Conference, whose property they shall become. All reports shall be presented to the Executive Committee at least fourteen days before the annual meeting.

⁂ Authors are specially requested to send the titles of their Papers to The Hon. Gen. Secs. Brit. Pharm. Conf., 17, Bloomsbury Square, London, W.C., two or three weeks before the Annual Meeting. The subjects will then be extensively advertised, and thus full interest will be secured.

FORM OF NOMINATION.

I Nominate

(Name) ....

(Address) ....

as a Member of the British Pharmaceutical Conference.

Member.

Date ....

This or any similar form must be filled up legibly, and forwarded to *The Asst. Secretary, Brit. Pharm. Conf.*, 17, Bloomsbury Square, London, W.C., who will obtain the necessary signature to the paper.

Pupils and Assistants, as well as Principals, are invited to become members.

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Wyley, Mr. W. F., Hertford Street, Coventry.
Wylie, Mr. D. N., 1, College Street, Edinburgh.
Wyman, Mr. J. S., 58, Bunhill Row, E.C.
Wynne, Mr. E. P., 7, Pier Street, Aberystwith.

Yates, Mr. D., 32, Darwen Street, Blackburn.
Yates, Mr. F., 64, Park Street, Southwark, S.E.
Yates, Mr. R., 64, Park Street, Southwark, S.E.
Yeatman, Mr. F. J., 141, Kentish Town Road, N.W.
Yeomans, Mr. J., 22, Petty Cury, Cambridge.
Yorath, Mr. T. V., 120, Cowbridge Road, Cardiff.
Young, Mr. J., 20, High Street, Newport, Mon.
Young, J. Rymer, F.C.S., 42, Sankey Street, Warrington.
Young, Mr. J. R., 17, North Bridge, Edinburgh.
Young, Mr. J. R., junr., 17, North Bridge, Edinburgh.
Young, Mr. R. F., New Barnet.

NOTICE.

Members are requested to report any inaccuracies in these lists by letter, addressed as follows:—

THE ASST. SECRETARY,
BRIT. PHARM. CONF.,
17, *Bloomsbury Square,*
London, W.C.

SOCIETIES AND ASSOCIATIONS

INVITED TO SEND DELEGATES TO THE ANNUAL MEETING.

The Pharmaceutical Society of Great Britain.
The North British Branch of the Pharmaceutical Society of Great Britain.
The Pharmaceutical Society of Ireland.

ABERDEEN AND NORTH OF SCOTLAND.—Society of Chemists and Druggists (1839). Mr. A. Strachan, 138, Rosemount Place, Aberdeen.

BIRMINGHAM.—Midland Pharmaceutical Association. Mr. Geo. E. Perry, Edgbaston, Birmingham.

BRIGHTON.—Association of Pharmacy (1861). School of Science and Art, Brighton.

BRISTOL.—Pharmaceutical Association (re-established 1869). G. F. Schacht, F.C.S., 52, Royal York Crescent, Clifton, Bristol.

COLCHESTER.—Association of Chemists and Druggists (1845). Mr. J. C. Shenstone, 13, High Street, Colchester.

DOVER.—Chemists' Association. Mr. R. M. Ewell, 37, Town Wall Street, Dover.

DUNDEE.—Chemists and Druggists' Association (1868). Mr. J. Russell, 111, Nethergate, Dundee.

EDINBURGH.—Chemists' Assistants' Association. Mr. E. J. Dey, 36, York Place.

EXETER.—Exeter Pharmaceutical Society (1845).

GLASGOW AND WEST OF SCOTLAND.—Pharmaceutical Association. Mr. Alexr. Laing, 211, Great Western Road.

HASTINGS.—Chemists' Association (1884). Mr. A. N. Beck, 11, York Buildings, Hastings.

HULL.—Chemists' Association (1868). Mr. C. B. Bell, 6, Spring Bank, Hull.

LEEDS.—Chemists' Association (1862). G. Ward, F.I.C., F.C.S., Millgarth Mills, Leeds.

LIVERPOOL.—Chemists' Association (1868). Mr. Anthony S. Buck, Royal Institution, Liverpool.

LONDON.—Chemists' Assistants' Association. E. J. Parry, B.Sc., 103, Great Russell Street, W.C.

MANCHESTER.—Pharmaceutical Association. Mr. A. Blackburn, 7, Exchange Street.

NOTTINGHAM.—Nottingham and Notts Chemists' Association (1863). Mr. W. Gill, Radford Road, Nottingham.

OLDHAM.—Chemists' and Druggists' Assistants and Apprentices' Association (1870). Mr. C. G. Wood, Secretary, Church Institute, Oldham.

SHEFFIELD.—Pharmaceutical and Chemical Society (1869). Mr. C. O. Morrison, 137, West Street, Sheffield.

SUNDERLAND.—Chemists' Association (1869). Mr. J. Harrison, 33, Bridge Street, Sunderland.

PRESENTATION COPIES OF THE YEAR-BOOK OF PHARMACY ARE FORWARDED TO THE FOLLOWING:—

The Honorary Members.

Libraries.

American Pharmaceutical Association; British Medical Association; Chemical Society of London; Ecole Supérieure de Pharmacie, Montpellier; Ecole Supérieure de Pharmacie, Paris; Massachusetts College of Pharmacy; The Mason College, Birmingham; Missouri College of Pharmacy; New Zealand Board of Pharmacy; North British Branch of the Pharmaceutical Society; Pharmaceutical Society of Great Britain; Pharmaceutical Society of Ireland; Pharmaceutical Society of New South Wales; Ontario College of Pharmacy, Toronto; Pharmaceutical Society of Australasia; Pharmaceutical Society of Queensland; Royal Society of London; Société de Pharmacie, Paris; State of Illinois Board of Pharmacy; Yorkshire College of Science.

Provincial Associations (having Libraries).

Aberdeen Society of Chemists and Druggists; Brighton Chemists' Association; Bristol Pharmaceutical Association; Colchester Association of Chemists and Druggists; Dover Chemists' Association; Dundee Chemists and Druggists' Association; Edinburgh Chemists' Assistants' Association; Glasgow and West of Scotland Pharmaceutical Association; Hastings Chemists' Association; Hull Chemists' Association; Leeds Chemists' Association; Liverpool Chemists' Association; London Chemists' Assistants' Association; Manchester Chemists and Druggists' Association; Midland Pharmaceutical Association; North of England Pharmaceutical Association; Nottingham and Notts Chemists' Association; Oldham Chemists and Druggists' Assistants and Apprentices' Association; Sheffield Pharmaceutical and Chemical Association; Sunderland Chemists' Association.

Journals.

American Druggist; American Journal of Pharmacy; Archiv der Pharmacie; British and Colonial Druggist; British Medical Journal; Canadian Pharmaceutical Journal; Chemical News; Chemist and Druggist; Journal de Pharmacie et de Chimie; Lancet; Medical Press and Circular; The National Druggist; Pharmaceutical Journal; Pharmaceutische Centralhalle; Répertoire de Pharmacie.

THE FOLLOWING JOURNALS ARE RECEIVED FROM THEIR RESPECTIVE EDITORS:—

American Druggist; American Journal of Pharmacy; Archiv der Pharmacie; Australasian Journal of Pharmacy; British and Colonial Druggist; British Medical Journal; Canadian Pharmaceutical Journal; Chemical News; Chemist and Druggist; Journal de Pharmacie et de Chimie; National Druggist; Pharmaceutical Journal; Pharmaceutical Record; Pharmaceutische Centralhalle; Proceedings of the American Pharmaceutical Association; Répertoire de Pharmacie.

PROGRAMME OF THE PROCEEDINGS

OF THE

BRITISH PHARMACEUTICAL CONFERENCE

AT THE

THIRTY-FIRST ANNUAL MEETING, OXFORD, 1894.

OFFICERS.

President. N. H. MARTIN, F.L.S., F.R.M.S.

Vice-Presidents.

(Who have filled the office of President.)

THOMAS B. GROVES, F.C.S., Weymouth.
G. F. SCHACHT, F.I.C., F.C.S., Clifton, Bristol.
R. REYNOLDS, F.I.C., F.C.S., Leeds.
PROF. ATTFIELD, Ph.D., F.R.S., F.I.C., F.C.S., London.
J. B. STEPHENSON, Edinburgh.
T. GREENISH, F.C.S., F.R.M.S., London.
S. R. ATKINS, J.P., Salisbury.
F. B. BENGER, F.I.C., F.C.S., Manchester.
C. UMNEY, F.I.C., F.C.S., London.
W. MARTINDALE, F.C.S., London.
E. C. C. STANFORD, F.I.C., F.C.S., Dalmuir.
OCTAVIUS CORDER, Norwich.

Vice-Presidents.

M. CARTEIGHE, F.I.C., F.C.S., London.
J. H. MATHEWS, London.
W. HAYES, Dublin.
G. T. PRIOR, Oxford.

Treasurer. JOHN MOSS, F.I.C., F.C.S., London.

Honorary General Secretaries.

W. A. H. NAYLOR, F.I.C., F.C.S., London.
F. RANSOM, F.C.S., Hitchin.

Local Secretary. H. MATHEWS, Oxford.

Other Members of the Executive Committee.

BOA, PETER, Edinburgh.
BOLTON, C. A., Nottingham.
DRUCE, G. C., M.A., F.L.S., Oxford.
FARR, E. H., Uckfield.
GERRARD, A. W., F.C.S., Chertsey.
HODGKIN, J., F.I.C., F.C.S., London.
HOLMES, E. M., F.L.S., London.
PAYNE, J. O. C., J.P., Belfast.
WRIGHT, R., F.C.S., Buxton.

Auditors.

JOHN WILFORD, Nottingham, and C. CLAYTON, Oxford.

Assistant Secretary.

J. C. NIGHTINGALE.

Editor of Year-Book.

LOUIS SIEBOLD, F.I.C., F.C.S.

Local Committee.

BATES, J., Bicester
BLOXAM, W. E., Oxford.
BOYCE, J. P., Windsor.
BRADLEY, C., Reading
BROOKS, H. J. R., Oxford
BURBANK, T. J. A. R., Oxford
BURMEIT, J. F., F.C.S., Oxford.
CARDWELL, E., Reading
CLAYTON, C., Oxford
COURT, G. F., Oxford.
DOLBEAR, J. (*Hon. Treasurer*), Oxford
DRUCE, G. C., M.A., Oxford.
EDEY, T., Oxford.
GILKES, W. H., Oxford
HILL, J. H., Oxford.
HOLMES, Mr., Brill
HOW, Mr., Oxford
HUTTON, H., Leamington
JENKINS, A., Oxford
JESSOP, J. H., Oxford.
MATHEWS, H. (*Hon. Local Sec.*), Oxford.
MATHEWS, J. H., London.
MORRISON, C. P. A., Oxford.
PALMER, J., Oxford.
PRIOR, G. T. (*Chairman*), Oxford.
SIMPSON, T., Bloxam-Banbury.
STANLEY, H., Leamington Spa.
SQUIRE, J., Oxford.
THURLAND, H., Oxford.
THURLAND, T., Oxford.
TURNER, J., Aylesbury
TUTE, F. C., Windsor.
UPTON, E. J., Wallingford.
USHER, R., Banbury
VARNEY, H. G., Oxford.
WOOD, R., Windsor.
WALKLETT, G., Oxford

THE SITTINGS OF THE CONFERENCE WERE HELD IN THE

HALL OF BALLIOL COLLEGE, OXFORD,

ON TUESDAY & WEDNESDAY, JULY 31 AND AUGUST 1, 1894,

Commencing at Ten a.m. each day.

MONDAY, 30th JULY.

The EXECUTIVE COMMITTEE met according to notices from the Honorary General Secretaries, at 6 p.m., at the Randolph Hotel, Oxford.

TUESDAY, 31st JULY.

The CONFERENCE met at 10 a.m., adjourning at 1 p.m.; and at 2 p.m., adjourning at 4 p.m.

Order of Business.

Addresses of Welcome by the Right Worshipful the Mayor of Oxford, and Sir Henry Acland, Bart., K.C.B.
President's Address.
Reception of Delegates.
Report of Executive Committee.
Financial Statement.
Report of Treasurer of the "Bell and Hills' Library Fund."
Report of Unofficial Formulary Committee, by W. Martindale, F.C.S.
Reading of Papers and Discussions thereon.

PAPERS.

1. *Note on the Stability of the Alkaloidal Tinctures.* By E. H. Farr and R. Wright, F.C.S.
2. *Gravimetric and Volumetric Methods for the Determination of the Alkaloids in Alkaloidal Tinctures.* By E. H. Farr and R. Wright, F.C.S.
3. *The Qualities of a Typical Dentifrice.* By Arthur Turner, F.C.S., L.D.S.
4. *A New and More Economical Process for Extractum Nucis Vomicæ.* By E. W. Lucas, F.C.S.
5. *Note on Strychnos Ignatia.* By F. Ransom, F.C.S.
6. *Remarks on Gnetum.* By W. Elborne, B.A. (Cantab.).
7. *The Recovery of Residual Tinctures from Marcs.* By R. H. Parker, F.C.S.
8. *The Pharmacopœial Instruction for the Preparation of Tinctures.* By R. H. Parker, F.C.S.

There was a mid-day adjournment between 1 and 2 p.m. for luncheon at the Randolph Hotel.

In the afternoon, after the adjournment of the Conference sittings, a garden party was held in the grounds of New College, by kind permission of the Warden and Fellows, and was well attended. The magnificent gardens were greatly admired, while the pleasure derivable from picturesque surroundings and friendly conversation was enhanced by the ballad singing of the "Kammer" Glee Quartett, under the direction of Mr. E. Jackson of New College. Afternoon tea was served, and the weather was perfect.

WEDNESDAY, 1st AUGUST.

The CONFERENCE met at 10 a.m., adjourning from 1 till 2 p.m. The whole of the business of the Conference was completed this day about 4.30 p.m.

Order of Business.

Reception of Delegates.
Reading of Papers and Discussions thereon.

PAPERS.

9. *Laboratory Notes.* By F. C. J. Bird.
10. *Note on Extract of Malt with Cod Liver Oil.* By H. W. Jones, F.C.S.
11. *The Keeping Qualities of Certain Samples of Spirit of Nitrous Ether.* By H. W. Jones, F.C.S.
12. *Notes on the Geology, Botany, and River Systems of Oxford and Neighbourhood.* By G. C. Druce, M.A.
13. *Animal Extracts.* By C. E. Stuart, B.Sc.
14. *Leonurus Cardiaca.* By E. M. Holmes, F.L.S.
15. *Examination of Leonurus Cardiaca.* By W. A. H. Naylor, F.I.C.
16. *Conditions of Papain Digestion.* By S. Rideal, D.Sc. (Lond.), F.I.C.
17. *Note on Cocoa-nut Stearin as a Basis for Suppositories.* By C. J. S. Thompson.
18. *Note on Phosphorus Pills.* By R. H. Parker, F.C.S.
19. *The Nomenclature of Official Remedies.* By Joseph Ince, F.L.S.
20. *English Medicinal Rhubarb and Henbane.* By Richard Usher.
21. *Tinctura Eryotæ Ammoniata.* By J. T. Hornblower.
22. *The Adaptation of the Soap Basis of Lin. Pot. Iodid. c. Sapone to some other B.P. Liniments.* By E. W. Lucas, F.C.S.
23. *Tincture of Iodine and its Analysis.* By J. F. Liverseege, F.I.C.
24. *The Calibration of Pipettes.* By J. F. Liverseege, F.I.C.
25. *Extract of Indian Hemp.* By David Hooper, F.I.C., F.C.S.
26. *Some Fallacies in the Testing of Essence of Lemon.* By Arthur A. Barrett.
27. *Notes on Rhubarb.* By Barnard S. Proctor, F.I.C.

Presentation from "Bell and Hills' Fund."
Election of Formulary Committee.
Place of Meeting for 1895.
Election of Officers for 1894–5.

There was a mid-day adjournment between 1 and 2 p.m. for luncheon at the Randolph Hotel.

THURSDAY, 2nd AUGUST.

RIVER EXCURSION to Abingdon. For particulars, see page 585.

BRITISH PHARMACEUTICAL CONFERENCE.

MEETING AT OXFORD, 1894.

THE Thirty-first Annual Meeting of the British Pharmaceutical Conference commenced its sittings on Tuesday, July 31st, in the Hall of Balliol College, Oxford, N. H. Martin, Esq., F.L.S., F.R.M.S., in the chair.

The following members and friends were present during the meeting:—

Aberchurch—Johnston, R., M.B.
Aberdeen—Johnston, Jno.; Kay, Fred W.
Anerley—Tompsett, L. S.
Aylesbury—Turner, Arthur; Turner, J.
Banbury—Usher, Richard.
Bath—Partington, J. J.
Bedlington—Foggan, G.
Bicester—Bates, J.
Birkdale—Marsden, P. H.
Birmingham—Alcock, F. H.; Gibbs, R. Darton; Perry, George E.; Prosser, Mr. and Mrs. H. S.; Thompson, Mr. and Mrs. Chas.
Bolton—Forbes, J. W.
Bournemouth—Bilson, F. J.; Hardwick, Stewart; Spinney, F.; Toone, Mr. and Mrs. J. A.
Brighton—Savage, Marion; Savage, W. W.; Gibson, W. H.
Bristol—Burnett, R. W.
Buxton—Wright, R.
Cambridge—Campkin, A. Sidney.
Cardiff—Coleman, Alfred.
Chertsey—Gerrard, A. W.
Clapham—Robinson, W. P.
Clifton—Schacht, G. F.; Towerzey, A.
Conway—Williams, Mr. and Mrs. W. G.

Coventry—Jones, H. W.

Dalkey—Beggs, G. D.; Beggs, Mrs.

Dartford—Williams, W. Lloyd.

Diss—Whitrod, H. F.

Exeter—Gadd, H. W.; Lake, J. H.; Luxton, Fred.

Glasgow—Currie, W. L.; Williams, L.; Kinninmont, Alex.; Miss Kinninmont.

Hampstead—Sangster, Arthur.

Hitchin—Ransom, F.; Ransom, Mrs.

Hull—Linford, J. S.

Hurstpierpoint—Mitten, Flora; Mitten, K. E.

Kirkcaldy—Storrar, D.

Leamington—Hutton, H.

Leeds—Reynolds, Richard; Miss Reynolds; Ward, G. W.

Leicester—Butler, E. H.

Liverpool—Buck, A. S.; Conroy, M.; Conroy, Mrs. and Miss; Symes, Charles.

London—Bird, F. C. J.; Bremridge, Richd.; Burden, E. M.; Carteighe, M.; Carteighe, Mrs.; Crawshaw, E.; Eastes, Ernest; Elborne, Mr. and Mrs.; Emerson, H. E.; Flux, Wm.; Gane, E. H.; Greenish, Hy. G.; Hall, H. E.; Hills, W.; Humphrey, John; Ince, Joseph; Ince, Mrs.; Ince, Walter H.; Kühn, B.; Lucas, E. W.; Marsh, E. R.; Martindale, W.; Mathews, J. H.; Moss, John; Naylor, W. A. H.; Nightingale, J. C.; Parker, R. H.; Parry, E. J.; Parry, Mrs.; Pettinger, E.; Shears, James; Spilsbury, J.; Strother, Chas.; Taubman, Robt.; Taylor, George S.; Taylor, Miss; Taylor, Miss M. A.; Tingle, J. Grantley; Tyrer, Thomas; Umney, Chas.; Want, W. P.; Warren, W.; Webb, E. H.; Weston, Mrs.; Weston, S. J.; Wink, J. A.; Wright, Theo. K.

Louth—Simpson, Hy. D.

Manchester—Cooper, F. R.; Cooper, Mrs.; Johnstone, C. A.; Kemp, Henry; Pidd, N. J.

Manningham—Newbould, J. M.

New Barnet—Hayles, B. H.; Young, R. Fisher.

Newcastle-on-Tyne—Martin, N. H. (President); Martin, Mrs.; and the two Misses Martin; Johnson, R. J.; Sharp, W.

Nottingham—Bolton, C. A.; Dennis, Mr.; Dennis, Mrs.

Northallerton—Fairburn, H.

Oxford—Bremridge, R. H.; Burnett, Jos. F.; Clayton, C.; Dolbear, J.; Druce, G. C.; Jessop, J. W.; Mathews, Hy.; Prior, G. T.; Wheeler, A.

Putney—White, Edmund; White, Mrs.

Radcliffe—Smith, Mr. and Mrs. J. T.
Ramsgate—Gadd, W. F.
Reading—Long, Henry; Cardwell, E.
Salisbury—Atkins, S. R.
Settle—Shepherd, J. W.
Sevenoaks—Holmes, E. M.
Shrewsbury—Cross, W. Gowen.
South Kensington—Dyson, W. D.; Dyson, Mrs.
Swindon—Green, J.
Uckfield—Farr, E. H.
Waterloo—Alexander, J.
Wellington—Bates, J. A.
West Hampstead—Hyne, H.
Weymouth—Groves, Thos. B.
Wigan—Johnson, Thos.
Wolverhampton—Gibson, F. J.

Meeting of the Executive Committee.

A meeting of the Executive Committee was held at the Randolph Hotel, Oxford, on Monday, July 30th, at 6 p.m.

Present:—Mr. N. H. Martin (President); Messrs. Atkins, Groves, Reynolds, Schacht, Martindale, Mathews, Umney, and Prior (Vice-Presidents); Mr. Moss (Treasurer); Messrs. Druce, Gerrard, Bolton, Holmes, Farr, and Wright; Mr. H. Mathews (Hon. Local Secretary); Messrs. Naylor and Ransom (Hon. Gen. Secretaries); and Mr. J. C. Nightingale (Asst. Secretary).

The minutes of the previous meeting were read and confirmed.

The Treasurer's financial statement for the year 1893–94 was read and approved.

A draft report for presentation at the annual meeting was submitted by the Hon. Gen. Secretaries, and agreed to.

A proposed list of officers for the ensuing year was adopted for recommendation to the general meeting for election.

The draft programme for the proceedings of the sittings of the Conference was laid on the table and approved.

The place of meeting for 1895 was considered, and it was announced that a cordial invitation from Bournemouth would be offered at the general meeting.

By a unanimous vote the Editor of the *Pharmaceutical Journal* was thanked for his liberality in providing visiting members of the

Conference and their friends individually with a free copy of a specially indited illustrated handbook of "Oxford and its University."

The following six gentlemen having been duly nominated were elected to membership:—

Baker, W. C.....London.
Dutton, H. V. .....Rockferry.
Everson, H. C. .....London.
Howard, D. Lloyd.....Stratford.
Lee, E. Hy. .....London.
Shears, J. C. .....Surbiton.

GENERAL MEETING.

Tuesday, July 31st.

The business of the thirty-first annual meeting of the British Pharmaceutical Conference commenced on Tuesday morning, July 31st, in the Hall of Balliol, the chair being taken by the President, MR. N. H. MARTIN, F.L.S., F.R.M.S. He was supported by the Mayor of Oxford, the Master of Balliol, and Sir Henry Acland, Bart., K.C.B.

THE MASTER OF BALLIOL (Dr. Edward Caird) opened the proceedings by welcoming the Conference to the Hall of Balliol, which, he said, could not be put to better use than to serve as the meeting place of conferences such as this, in which those engaged on any particular subject met together to exchange their views, to compare notes, and so to advance the subject in which they were interested.

The MAYOR OF OXFORD next, in the name of the citizens, extended a welcome to the Conference to the ancient city, in which during the last quarter of a century he said there had been a growing custom year by year to receive deputations and conferences of visitors representing the learned societies of England. He hoped that these meetings would continue to be held from time to time and result in much good, and that, on the other hand, the visitors would find much to interest them, and would go away with kindly recollections of the city of Oxford.

Sir HENRY ACLAND, Bart., said he was very grateful for the opportunity of being present at this Conference. He was not officially deputed by the authorities of the University to welcome

them, but it was his duty to do so, on the part of the University, so far as he might, but beyond that, on behalf of the nation and of science. The President and many present were aware that the whole question of science, particularly medical science, and along with it the question of scientific pharmacy, was undergoing a change and going through a process of enlargement which the world had never before seen. This depended on various causes—on the progress of biology, and on the broad views taken of the whole nature of life upon our planet—and attention was now being given throughout the world, not so much to the treatment of disease as to the prevention of it. This was a point which he might not have mentioned but for the fact being clearly mentioned in the "Extra Pharmacopœia," and as reference was made to the fact that already in this country pharmacists were considering the relation of bacteriological studies to the treatment of disease. This, of course, looking at pharmacy from the artistic rather than the scientific side, raised the question how the line was to be drawn between the preparation of those things which would be required in the future from the few old-fashioned remedies which he remembered in his youth. To pursue this subject further would take too long, he hoped to hear something upon it in the course of the meeting, but he would repeat that this was not only a national question for England, but for the whole world, as was shown by the congresses held, or being held, at Chicago, Japan, and Buda-Pesth for the prevention of disease. As he said at the Pharmaceutical Society in London several years ago, he owed a life-long debt to English pharmacists. When he was at the commencement of his education—he hoped he had not yet completed it—at a great London medical school, in 1840, there was no popular teaching of pharmacy, and the late Peter Squire, who would not take pupils, made an exception in his case, and allowed him the run of his house from cellar to attics, so that he had the opportunity of seeing every process that went on in that establishment. The following year he found there was no teaching of practical chemistry, and another member of the pharmaceutical body, Mr. Lloyd Bullock, the friend of Liebig, and the translator of Fresenius, in the little laboratory at the back of what was called his shop, worked with him for several weeks, instructed, scolded and taught in a way that could not be surpassed. He had a life-long affection for those two men and a deep feeling of gratitude, which it was his bounden duty, as well as his pleasure, to acknowledge. He learned from those two men a great deal more than the elements

of scientific chemistry and pharmacy; he saw the value of character, for he would undertake to say that Peter Squire, so far as his knowledge went, never had anything in his place but what he believed to be of the very best; and he had seen Mr. Bullock throw away a whole evaporating dish of ammonio-citrate of iron which he thought had not been properly made. Beyond education and science, personal character was of the highest importance, and should always be so regarded.

The PRESIDENT, in the name of the Conference, thanked the Master of Balliol, the Mayor, and Sir H. Acland for the welcome they had extended. It was a great pleasure to be so kindly received by a man who was known to be the rejuvenator or re-creator of the teaching of natural science in connection with the University, seeing that natural science was the foundation of pharmacy. He hoped what had been said by Sir H. Acland would sink into their minds, and he should like to emphasize one word he had used on those who had to do with the teaching of young men. Sir Henry said that his own early education included scolding, and he feared that in the present day there was far too much petting and bribing and hardly enough scolding. He entirely agreed with what he said about bacteriology, and, in connection with one of the papers about to be read, he intended to have said, what had now been said in effect by so much higher an authority, that the chemist and druggist of the future would have to be a man who could not only make tincture of rhubarb, but could make a culture of scarlet fever when it was required to treat a scarlet fever case. He must be a scientist and be able to prepare and guarantee all the products he handed to the physician for the treatment of disease.

The PRESIDENT then delivered his address.

THE PRESIDENT'S ADDRESS.

GENTLEMEN,—At the outset of my address I desire to conform to a custom which I think we do well to honour, and that is to express to you my sense of the distinction which you have conferred upon me by electing me to be your President. To be thought by my *confrères* to be fitted in some small degree to stand in the place which has been occupied and adorned by such distinguished men and pharmacists as Deane, Hanbury, Stoddart, Brady, Redwood, and others who have occupied this chair, is a

sufficient cause for modest and honourable self-respect, and I should not be human if I did not appreciate that honour, and feel proud of the dignity. I do not propose to occupy your time by expressions about my own unworthiness, for although the fact, and the causes of it are better known to me than they can possibly be to you, the attempt to put them into words would miss that ring of true sincerity which I have tried to make the touch-stone of my life. I prefer to accept your decision in silence as to my own shortcomings, and to tell you that since your choice has fallen on me, I have done my best to make my unworthiness more worthy of your acceptance.

As you are all aware, we are indebted to the courteous invitation of the pharmacists of this city and neighbourhood for our meeting here to-day, and I congratulate the Conference upon the opportunity of assembling for the first time in its history in this ancient university city.

Oxford is as fresh to me as I have no doubt it is to many of you, but we shall every one of us share an Englishman's just pride in the renown of this historic seat of learning. Perhaps to some of us it was a dream and a hope of our early days that our own education would have embraced an Oxford or Cambridge career, but such dream may have been rudely dispelled by the force of circumstances, and the ideal of education which we thought could have been obtained here, by the culture of surroundings, we have only been able to seek after by much plodding and gleaning in outside fields. If I were free to occupy your time with thoughts other than those connected with pharmacy, what a fruitful source of inspiration this place would be. The beauty and history of its buildings, the men who have walked these streets and lingered in these ancient halls and colleges, and who have gone out from here to influence so profoundly the whole history of the world, would indeed furnish any audience of Englishmen with food for profitable meditation. In our thoughts about Oxford most of us will have connected it with classical and mathematical studies, and with the remembrance that here have been trained some of the deep thinkers in the realms of philosophy, of theology, and of history. To us as pharmacists, however, and as workers in the domain of natural history and science, the Oxford Museum cannot fail to be an object of the deepest interest; and while I hope you will take away from Oxford many delightful mental pictures of art, of architecture, and of natural beauty, I would commend the museum and all that pertains to it to your most thoughtful attention and

study. I may not linger here, but I should like to point out the wide difference which exists between the Oxford Museum and our ordinary conception—and, I am afraid I must add, our experience—of museums in general. In the dictionary you will find a museum defined as a "repository of interesting objects," and in too many cases in this country they are "repositories," and nothing more. Here, however, you will find the museum is not the grave of curious and interesting specimens, but is the centre of a vital contact with nature and science. You will find the museum proper surrounded by suitable buildings and by every provision for education, for study, and for research in the various branches of natural science, and the objects in the museum are used to fulfil their proper function in illustrating the lectures of the professors and enriching the knowledge of the students. In my own city we have a natural history museum, rich in specimens, and we have colleges of science and of medicine, under wholly different management, at no great distance, and every lover of scientific truth in the North must regret with me that the dry bones of the museum are not vivified by contact with the living teachers and students of science. It is an evidence of the clear judgment and breadth of view which university life and training imparts, that here in Oxford the museum has not been conceived in the spirit of the miser, to collect and to hoard, but the collections are used to communicate pure streams of accurate knowledge to all who will come and drink at this fountain. You will see that medicine forms no inconsiderable part of the teaching associated with the museum, but according to Sir Henry Acland, "the function of the Oxford Museum towards medicine is to train good scientific observers and thinkers to become observers and thinkers in pathological and therapeutic and preventive processes." I trust it is not a mere dream to hope that some day pharmacists will be found here amongst the students laying the foundation to become "good scientific observers and thinkers."

The subject of my address will be medicine and pharmacy, and however well the story of these may have been told by my predecessors, I am by virtue of my position under the necessity of keeping to the beaten track, and I have no desire even to shirk the responsibility. I purpose to take full advantage of my position as your President and to speak to you *ex cathedra*. I do not expect that you who hear me, or that those who may afterwards read what I shall say, will agree with all that I express, but of one thing I beg to assure you, my views upon this subject have

not been hastily adopted, and they are not lightly held. They are the outcome of more than thirty years of a wide contact with pharmacy and medicine, and of loving service to pharmacy, which during that period has been to me not alone a source of income, but the means of bringing me into contact with a large proportion of the purest pleasures that have come into my life.

It is not possible to exaggerate the importance of medicine and pharmacy in the body politic. The duty of healing and caring for the sick should call forth in every right-minded man with the spirit of true nobility in his soul, feelings of the highest chivalry and honour, and he is surely one of the most miserable of human beings who is satisfied to pursue these callings for more gain, and to measure the success or failure of his life devoted to medicine by a money standard.

Our own daily work and our thoughts are more intimately connected with pharmacy, but we meet medicine on the common ground of drugs, their preparation and application in the treatment of disease. Medicine in the persons of those who practise it, and in the pages of its representative journals, does not hesitate to criticise and even to castigate pharmacy, and I propose to extend my remarks to revealing shortcomings in the practice of medicine. Let us turn first, however, to pharmacy, and ask the question whether in its own special domain its condition is satisfactory, and, if not, what is the cause of this, and what suggestions for its improvement can be offered. The Pharmaceutical Society has had an existence of over fifty years, and we have had a compulsory Act of Parliament for twenty-six years. In that period advances have been made which are obvious, and I need not recount them any more than I need place before you confirmatory evidence of the fact that the majority of those who are on the Register of Chemists and Druggists are dissatisfied with the actual practice of pharmacy to-day. Complaints are loud and deep against the Pharmaceutical Society because it does not bring about an improved condition of things, but in no case have I seen the confession by any large section of men on the Register that they have failed to realise the privileged position in which they were placed by the Act of 1868, and that they have neglected to conform to the keynote and true spirit of that Act, which was—education. I think you will agree with me that the greatest evil from which pharmacy is suffering to-day—unbridled and dishonest competition in prices—is mainly due to the enormous extent to which the use of proprietary medicines has increased, and to the fact that this has played the *role*

of introducing grocers, limited companies, and other unqualified and unregistered individuals and bodies to assist in their distribution, and has tempted them to add to their sale a large number of the drugs in common use, and finally has evolved that monstrosity of the nineteeth century, the "company pharmacist." Who is to blame for this? Surely not the Pharmaceutical Society, for whatever individuals may have done, the whole spirit and teaching of the Society is in direct opposition to pharmacists becoming the medium of distributing articles about which they have absolutely no personal knowledge, and about which they can give neither to physician nor to patient any information based upon their scientific training and experience as pharmacists. No, it is not the Pharmaceutical Society which is to blame, but it is the men on the Register who, in the past, in their several localities, by their endorsement of the falsehoods of these advertising quacks, have created on the part of the public this enormous and unhealthy demand for proprietary medicines, and have brought this Nemesis upon pharmacy.

Here I must mention a further development of the proprietary medicine system which has recently taken place, and which is fraught with far more peril to the existence of pharmacy than the proprietaries for domestic use, and in this both medicine and pharmacy have been ensnared by the wily commercial adventurer. In various guises, and by persistently advertising claims to improvements in pharmacy, men, seeking gold, have induced medicine and pharmacy to become their tools to enable them to reach the million. There are two chief methods by which this has been accomplished: one is by the registration of a word for some particular form in which drugs may be administered, the other is by the invention of names ("discretional names" I see one medical writer euphemistically calls them) which are used as blinds to suggest some original or added virtue, for compounds, the properties of the ingredients of which are perfectly well known. These enterprises would have met but with poor success if medical men and the medical journals had been true to themselves and to their own teaching. You can imagine the incredulous smile with which an accomplished physician would receive the assertion of some antiquated herbalist that he knew a weed which was an universal cure, but when such a weed is made the basis and furnishes the name to a compound manufactured by an enterprising company, and is presented to him with a sample bottle, a pamphlet bristling with comments from medical journals

and testimonials, under the name of Liquor Curaline Co., the amiable physician falls into the trap, and his next patient is dosed with the latest improvement in modern pharmacy—"Liq. Cure-all-ine Co." The medical journals, however, in their advertising columns and in their literary pages are the strongest supporters of these quackeries. I do not suggest, and it would be preposterous to suppose that the learned and versatile editor of the *British Medical Journal* would listen to an appeal of this sort.

"Dear Sir,—Advertising as we do in your valuable and esteemed medium, and being likely to continue the same in the future on an extensive and liberal scale, we shall esteem it a favour if you will kindly give us at an early date the superadded benefit of a free editorial, the substance of which we beg respectfully to submit herewith.—We are, dear Sir, yours faithfully, Bunkum, Quack and Co." There cannot be the slightest doubt of the reception which such a letter and such an appeal would get at the hands of the editors and proprietors of our leading medical journals. But let B., Q. and Co. approach the matter by advertising on an extensive scale in the Journal, and then send samples for analysis and report, and if we read nothing stronger it will at least come out something after the following:—

Skinnaline.

"It is claimed that the substance contains the active principles of skin in the proportion of twenty grains to the pound. We have put these claims to the test as far as possible, and we are satisfied that they are practically justifiable, but we are not able to endorse all that the discoverer claims for the preparation, although there is no reason to doubt his statements." To the stern logic of science, this is lukewarm enough in all conscience, but the astute advertiser is satisfied. He probably did not expect what was impossible, any definite analysis and report, but he knows, cautiously worded and valueless as the paragraph is as to the merits of skinnaline, he has only to quote the paragraph and add the magic words of the title of the journal, and the commercial result to him will be increased a hundredfold. I venture to assert that such notices are absolutely unworthy of the highest and best traditions of medical journalism, and they are the ruin of scientific medicine and pharmacy. I could give you many illustrations, but forbear to weary you. I believe the Americans were the first to make the discovery that the doctor might be made a cheap and efficient means of advertising, although the Germans have not

unsuccessfully cultivated the same field, and it is to this source that we owe the experience that the consulting rooms of the medical practitioner are deluged with "physician's samples" of the most arrant quackery the world has ever seen. When will English medicine have the courage to purge itself of this corruption?

It will be interesting, I think, to inquire into the possible reasons why medical men have so readily fallen into these traps, and I think one great and most important cause has been the neglect to give the medical student adequate training in the knowledge of the properties and uses of drugs. Since the abolition of apprenticeship to a general practitioner, which used to precede in medical education the scientific course which in those days was called "walking the hospitals," the tendency has been for more and more of the medical student's time to be taken up with the abstract sciences which are the basis of his art, and the practical side of being able to treat and cure disease by the intelligent use of medicines has been very largely neglected. The result is, that instead of the diagnosis and the cure going together in intelligent connection, they have been separated from each other, and it has happened to a brilliant and successful student of our medical colleges that, after having made the most exact diagnosis, the limit of his powers has been reached, and his grim function has been to watch the patient die, and to be able to predict the precise pathological changes which would be revealed at the necropsy. Another great cause, which I am sure has had a wider influence in discrediting the use of drugs in the treatment of disease than we can have any idea of, is the tender system under which many hospitals and infirmaries—where young men get their first lessons—are supplied with drugs. It is no secret that large quantities of inferior and almost useless drugs are year by year placed on the market, and I do not think it is in the least unfair or unjust to infer that these must largely find their way into the institutions and into the possession of those who make the price their sole criterion of value. It follows, quite in logical sequence, that teachers and taught are influenced by the variable and uncertain results obtained, and that sometimes in despair and sometimes in contempt there is produced a lack of faith in drugs as instruments of healing. I do not underrate in the smallest degree the importance of the medical student acquiring sound and extensive knowledge of physiology, pathology, and so forth; they are absolutely essential subjects, and I would not belittle the triumphs

and advances which recent years have seen in these directions, but the subject of profound importance to the patient is to be cured. The exorbitant claims sometimes advanced on behalf of such subjects as physiology, pathology, and chemistry have been fraught with no little danger to the art and practice of medicine, and it has happened that many a general practitioner, who in the realm of physical danger would be a hero, has been deterred by a sneer or an assumption of superiority on the part of some specialism from contending for the reality of the knowledge which is the result of his own life-long experience in the use of drugs, and the knowledge itself has, in some cases, been lost to the service of medicine in its combat with disease.

To return to pharmacy, the small amount of relative success which has resulted from the work of the Pharmaceutical Society is in my opinion largely due to the grave mistake which was made in the fifth clause of the Pharmacy Act, 1868. By that clause it was decided to place on the Register, without examination and without fee, all who claimed to have been in business as chemists and druggists prior to December 31, 1868. If an adequate fee for this privilege of being registered had been imposed, I think it would have had the effect of considerably reducing the number of those who desired to be placed on the Register from purely trade motives, and it would have created in the minds of those who were registered a wholesome feeling of respect for the body to which it had cost something to become affiliated. The result was that a large number of persons were placed upon the Register who were actually antagonistic to, and were active propagandists against the educational standards of the Society. It was probably thought that in the course of a generation these men would all die off, and that when the Register was composed entirely of men who had been placed there as the result of examination (again without a fee, I regret to say) a different spirit would prevail. But unfortunately our experience has shown it to be otherwise, and the baneful influence of the trade element is still predominant on the Register, to such an extent that it has captivated the judgment of some prominent men in the Society itself, and threatens to overthrow the very principle upon which the Pharmacy Act was obtained.

Pharmacy, as practised by the registered chemists and druggists of this country, is attempting an impossibility; it is seeking to grasp the commercial advantages, which in other callings can be obtained by the exercise of legitimate trade, whilst it desires to

retain the rewards which properly belong to professional services. This cannot go on much longer, and pharmacy must make its choice between trade and profession; but before I indicate in which direction I think the choice should be, let me briefly mention one or more of the prominent features which characterise the two.

The very essence of trade is that it is capable of indefinite expansion, and there is no limit to the extent to which a tradesman may sell his goods at the hands of assistants or through the agency of any number of intermediate persons between himself and the user of the article he sells. Apply this test to pharmacy, and you will see it is impossible for it to expand indefinitely in the fulfilment of its own proper functions, of dispensing the prescriptions which the physician has written for the individual patient, or prescribing for the smaller accidents and ailments to which human beings are liable. There will perhaps spring into your minds instances of the indefinite expansion which has followed the advertising of nostrums, but that is not pharmacy, but in many cases is merely obtaining money under false pretences. You all know Jerome's friend who visited the British Museum to read up the treatment for "hay fever," and plodding conscientiously through the book from A to Z found that the only complaint he had not got was "housemaid's knee," and so it is with nostrums. The complaint is, more often than not, suggested by the literature of the nostrum-monger before the nostrum effects the wonderful cure which is recorded in the testimonial.

The essence of a profession, on the other hand, is that the members of it receive a special education, and give evidence before a legally constituted body that they have been so educated; that the service is rendered personal and direct, and cannot legitimately be multiplied indefinitely through the agency of unqualified persons.

Tried by these criteria, I think you will agree that pharmacy, in the exercise of its legitimate function towards the public, is a profession and is not a trade. English people through their Legislature admitted this in 1868 when, by statute, they laid down the conditions upon which pharmacy should be carried on, and imposed restrictions of a similar kind to those which had before that belonged to the other professions, and which were not and are not imposed upon any trade. How does it happen that the very essence of pharmacy being a profession, that the Pharmaceutical Society and the Legislature having decided, in effect, that it is a profession, we seem as far off as ever from it being

practically recognised as such by the pharmacist and the public? It is due to the excessive preponderance of the trade element and of the commercial spirit amongst the registered men. This has handicapped the Pharmaceutical Society and rendered it impossible for the Society to advance upon the lines and in the spirit of the Pharmacy Act. We have seen the kindred profession of medicine increase its curriculum, or period of compulsory training, from three to four years, and again to five years, and in so doing it has steadily and deservedly risen in public esteem and respect; whilst notwithstanding the convictions and earnest desire of the Pharmaceutical Society, we have as yet no curriculum at all, and the voluntary training (for our examination) which our young men undergo, in a vast majority of cases, cannot be described by any less objectionable word than that of cram. The consequence is, that notwithstanding that the English people were willing to accept pharmacy as, and to give it the opportunities of, a profession in 1868, they are almost compelled in 1894, by the conduct of those who practise it, to come to the decision that pharmacy is nothing but a trade after all, and so it comes to pass that the grocer and the company pharmacist are so far on the road to win the rights and the privileges which belong to pharmacy. Pharmacy as a trade is a failure, and I go further and say that pharmacy, as well as medicine, conducted as a trade and in the spirit of a commercial venture, ought to fail. If we use our knowledge to exploit human ailments, to excite men's fears and to play upon human credulity for gain, we ought most ignominiously to fail. You will be prepared to hear that my own strong conviction is that pharmacy should realise its privilege and seriously proceed to take steps to accept its responsibilities as a profession, and no time should be lost in setting about it. I will only very briefly indicate the steps which are necessary, and trouble you as little as may be with small details. Our entrance examinations should be made a much more stringent test of a young man's intellectual powers and of his school training than it is. It is useless to expect men to be able to grasp the problems of organic chemistry whose knowledge of mathematics has not gone beyond the simple arithmetic which our present examination requires. This examination should include algebra and geometry, the Latin should be extended to a knowledge of the selected authors beyond a mere cram of the meaning of words, history and geography, and a modern language should be included, and the examination should be passed not earlier than at seventeen years of age, but before apprenticeship.

Following this should come three years of actual (not nominal) apprenticeship, during which the powers of observation should be cultivated, and by continual exercise in the practical operations of pharmacy, under suitable instruction, all that deftness of manipulation and that wise caution in handling things which is a characteristic of the trained pharmacist, should be acquired. A large amount of knowledge of the physical characters of drugs and preparations would necessarily be obtained during this period, and the apprentice whose mind was in his work would certainly do some reading in connection with it. Then should come the curriculum, or the period of enforced study, upon a syllabus taught in recognised colleges and schools throughout the country; this period should not be for less than two years, and the whole time of the student should be engaged in training and preparing for the work of his life. During these two years, at certain intervals the progress of the student should be officially ascertained, and at the end, his fitness to become a pharmacist should be tested by one week or more of examination, written, oral and practical, in the subjects of botany, chemistry and materia medica; and if the result was satisfactory, I would give the qualification and title of pharmacist. The training and examination should take the student at least as far—I should advocate further in some directions—as our Major examination, and I would abolish all intermediate names which even suggest qualification. When the pharmacist has undergone this, as a minimum of his training and proof of his qualification, I think he will have some right to consider himself, and to be considered by the public, a professional man. But now will arise in your minds the question that having elevated your pharmacist to the status of a professional man, what is he to do, and how is he to live? Medical men, to an enormous extent, dispense the prescriptions for their own patients, and they are exceedingly emphatic in their protest against the pharmacist prescribing.

The treatment and cure of disease are the legitimate functions of medicine and pharmacy in co-operation, and no rigid line of demarcation is possible. Broadly, the operations of surgery, the diagnosis of disease and prescribing belong to medicine, and the preparation and dispensing of the remedies to be used in the treatment of disease belong to pharmacy.

Doctor's dispensing is stated by many to be one of the chief, if not the chief cause of the ills from which pharmacy is a sufferer, and demands in more or less dignified terms are made that this

iniquity shall cease. I make no apology for the existence of this condition of things. Theoretically it is undoubtedly better that dispensing shall be done by the pharmacist, and prescribing by the medical man; but when we pharmacists claim this as a right, and accuse medicine of unjustly usurping our functions, it is well for us to remind ourselves that medical men, although they may not now as frequently as of old take the degree of L.S.A., are the direct and legitimate successors of the old apothecary, and that the dispensing of medicine was their legitimate function. So much was this the case, that there being a doubt as to whether it was traversed by our own Act of 1868, the short Act of 1869 was passed to preserve the right. Then again it is deep rooted in the habits of the English people to expect the doctor to supply the medicine he has prescribed, and any change can only come about by the slow process of educating the patients, and by the exhibition of good will and feeling between medicine and pharmacy. Before it can happen universally, there is no doubt that pharmacy must have acquired such a professional standing and education as will enable it to perform its delicate and confidential function with the tact and reserve which is the outcome of prolonged training. The mistake (a very common one) which pharmacy is making is, that it wants the reward before it has made the effort and suitably equipped itself for the service. I exhort the pharmacist of the future to be unremitting in his efforts to raise himself and his calling to a professional status, and then I predict for him that in the natural course the dispensing of medicines will come to him.

Chemist's prescribing is quite as loudly complained of by the doctors, and when I read some of the letters and comments which appear in the medical journals I am almost tempted to fear that for once medicine is thinking more of its share of the pecuniary reward than caring for suffering humanity. There is, however, I am sorry to say, a great deal too much prescribing by chemists, and some of it is of a most reprehensible kind. I know a case where a chemist treated a man suffering from rodent ulcer of the face for two years, all the time buoying the man up with the hope that it was getting better, and that he would cure it, until the face was so bad and the ulcer had spread to such an extent that, when it came under the notice of the surgeon, nothing could be done for the patient. If that chemist had met the man upon the highway and robbed him, he would have been liable to imprisonment; but having got the man into his shop, he not only

robbed him of his money, but he rendered it impossible for the man ever again to be restored to health. For the dishonour which such men bring upon pharmacy, and for the irreparable injury which they inflict upon suffering humanity, I should like to give them several years of penal servitude. But there are innumerable small accidents and little ailments to which humanity is liable which quite legitimately come within the province of pharmacy to treat, and the pharmacist, if he is wise, is a much safer man to treat these than the clergy and the laity, who are ever ready to prescribe for each other upon any and all occasions. The best and wisest exponents of medicine admit this right on the part of pharmacy, and welcome the service which is rendered by it to sufferers. Pharmacy may make some mistakes, but I know it frequently sends patients to medicine long before they or their friends would think seriously enough of the case to do so.

There should be no rivalries or jealousies between medicine and pharmacy, and the better qualified each of these may be to exercise its own share of the duties devolving upon both, the more will each of them respect the rights and the work of the other.

Before I conclude, one word on the principle upon which remuneration should be based. This is a question of the utmost importance to the English public, as well as to pharmacists. John Ruskin says, "You do not pay judges large salaries because the same amount of work could not be purchased for a smaller sum, but that you may give them enough to render them superior to the temptation of selling justice." We cannot err in applying this principle to pharmacy, and deciding that the dispensing chemist must be paid at a rate of remuneration which will enable him to get his living honestly and openly, and render him superior to the temptation to increase his profit and his income by tampering in ever so small a degree with the quality of the drugs he uses, and with the health and may be the lives of dear ones and of men important to the community. His remuneration should also enable him to devote sufficient time and care to every detail of his responsible work, and eliminate a very real source of danger which is unavoidable if the haste and the bustle of trade methods are adopted by pharmacy.

The Conference has entered upon the fourth decade of its existence, and possibly I should have made a better and wiser choice if I had addressed you upon its past achievements and its future prospects, but the other matters upon which I have touched have seemed to me of greater importance. Let me say, however,

briefly, that I think the record of this Conference has been eminently an honourable one, and that it has fulfilled in a high degree the functions for which it was called into existence. The story is written in the *Year-Books*, and another phase of it is engraved in the hearts and memories of many of us who have been members almost from the beginning and who have attended a large number of its meetings. It has added to our knowledge, enlarged our experience, and broadened our intellectual grasp of pharmacy, and last, but not least, it has been the means of bringing together, introducing to each other, and cementing friendships between men who practise a common avocation in districts as wide apart as Inverness and Cornwall. In this latter function the excursion on the last day has played no inconsiderable part. Amongst the critics of the Conference there are some persons who affect to sneer at the excursion as if it were sheer frivolity, and was at variance with the avowed scientific objects of the Conference. I beg to differ, and to claim for the excursion day a very high place in the work of the Conference. It affords the opportunity, as no other arrangement could do so well, for men to meet; and I am quite sure that my own experience is by no means singular when I tell you that many, very many of the best friends I have in pharmacy were first known to me through the opportunity of one of the Conference excursions, and, further, I could not exaggerate to you the benefit which I have received from the numerous conversations and informal discussions which always take place on those days. But it is with societies as with individuals, they tend to decay, and already more than once we have the alarm—the Conference is on its last legs! I do not believe it, as I feel sure it fulfils a purpose in the realm of pharmacy which is too important for the Conference to be left to decay, and that if we neglect the trust which has been handed down to us, our successors will revive it. I would ask every member of the Conference to get at least one other member to join, and I do not think he can use a stronger argument than that, apart from the opportunity of attending and taking part in this annual scientific gathering of pharmacy, the *Year-Book* which he will receive is worth many times the subscription. The *Year-Book of Pharmacy* should find a place on the desk of every chemist and druggist in this land. In it he will find abstracts of papers from a larger number of sources than he can possibly consult for himself, and many of these papers may be of great value to him.

There is no occasion to disguise the fact that we do not get as

many, or possibly as good, papers sent to the Conference as we should like; but when we consider the needs of a weekly press and the number of small societies, which absorb in the aggregate a large number of papers, our experience need cause us neither surprise nor alarm. I should like, however, to ask many of those who are doing original work, and writing papers in connection with pharmacy, to consider whether there is any place so suitable for them to be read as at these meetings. The authors may feel certain of a larger audience to listen to their papers, and a far more capable set of men to discuss them than can be found at any other time or place. In provincial towns the papers are read to a few local men, and the discussion is taken part in by fewer still, and even at the monthly meetings at Bloomsbury Square the discussions have a great tendency to fall into the hands of very few men. However capable these men may be, they cannot possibly have the wide and varied experience of the aggregate of the men who attend this Conference. I would therefore venture to urge thoughtful pharmacists to contribute papers to this Conference, and I should like them to come in such numbers, that we may be compelled to add another day or two to our meeting.

I mentioned just now the friends whom we have made at these Conference meetings, and before I close I must briefly allude to those we have lost. The first name that will occur to you, I am sure, is that of our genial botanist, the late Professor Bentley, who was President at Nottingham in 1866, and in Dundee in 1867. Many of us knew him first and best at Bloomsbury Square as our dear and honoured teacher, but to many others the Conference must have been the means of their meeting him, and by all was he respected and beloved. He had reached a good ripe age, and of him it might be said—as of many other men who have lived and been true to themselves and their calling—"He has done his work well and earned his rest." The next, an even greater loss to us as a Conference, because of his younger age, and the promise there was in him of greater achievements for pharmacy, is our late Treasurer, Mr. R. H. Davies. I, with many others, made his acquaintance through this Conference, and I feel, as I am sure many of you do, that I have lost a personal friend with whom intimacy would have ripened year by year into stronger bonds.

Gentlemen, in conclusion, during the important business of the next two days I am your chairman and presiding officer, and in exercising the functions of that office, I will endeavour to secure a fair hearing for the many-sided opinions which in the discussions

on the papers are sure to find expression, but I should be afraid of the position if I did not know that the honour of this Conference as a whole is as dear as personal honour to every member of it, and that in those discussions no member will withhold facts which he may be able to contribute to the better understanding of the papers.

Mr. MICHAEL CARTEIGHE, in proposing a vote of thanks to the President for his address, said there was a special fitness in Mr. Martin occupying that position, since he did not think they had had a Newcastle man at the head of affairs since Mr. H. B. Brady, when the Conference was founded. Two out of the three founders were present to-day, Mr. Reynolds and Mr. Schacht, the latter having, he believed, the honour of having first suggested the idea of holding such annual meetings. He had never listened to an address with so much interest as he had that morning. They had had many extremely valuable addresses, some on scientific subjects, others on education, and others on sectional subjects, but at no time within its history had the Conference had put before it a few plain facts so tersely and plainly. If there was one thing he appreciated it was to see a man occupying a position of this kind who had an individuality and backbone. The characteristic of this address was manliness from beginning to end. Mr. Martin had spoken plainly, not of their virtues only, but of their faults and failings, and of the difficulties, largely due to ignorance, which beset the path of pharmacy. It was not his part to criticise or comment on the address, but he might say that he thoroughly agreed with what had been said as to the relation between medicine and pharmacy. It was a fact patent to all intelligent men, not necessarily pharmacists, that in many cases the man of medicine could not prescribe. He begged to move a hearty vote of thanks to the President for his admirable address.

Mr. G. C. DRUCE thought that the President's address had covered a very wide area and raised many debatable points. It was his pleasing duty to second the vote of thanks. The high tone of the President's address would mark it in the future, and he trusted the papers and excursions to follow would make the meeting a very enjoyable one, which all would remember with great satisfaction.

Sir HENRY ACLAND said there was one matter he had forgotten to mention before. They often heard that they were in a state of evolution, but that there was a process of evolution backwards as

well as forwards; in pharmacy, however, as far as he could judge, after listening to the President's address, the evolution was forward. When they visited the Museum they would see that the University had within the last three or four years established a special reader in materia medica, pharmacy, or pharmacology, whichever it might be called; and he would point out that it would be very difficult to define the limits between those three subjects, and that one of the great difficulties of the future was how far experiments on living animals, and so on, should form part of the necessary studies of students. Whether in pharmacy and materia medica, or whether only in medicine, knowledge would go on, but one person could not hold it all. Still, the University had very properly instituted a special course of materia medica, and he was sure they would all be glad to hear that Dr. Lauder Brunton had been appointed Examiner.

The motion was put by Mr. Carteighe and carried unanimously.

The PRESIDENT, in acknowledging the vote of thanks, said he was aware that of late years the medical curriculum included a clinical study of drugs; but there was a time when the knowledge of drugs was to the medical student a minus quantity. It seemed to him of vital importance that whatever else a man knew, he ought to know something about the treatment and cure of the patient he visited.

RECEPTION OF DELEGATES.

Mr. F. RANSOM (Hon. Gen. Sec.) then read the following list of delegates:—

Pharmaceutical Society of Great Britain.—Messrs. M. Carteighe (President), W. G. Cross (Vice-President), R. Hampson (Treasurer), Atkins, Bottle, Gostling, Grose, Hills, Martin, Martindale, Schacht, Southall, and Young; the Editor, Sub-Editor, and Secretary.

North British Branch.—Messrs. J. Laidlaw Ewing (Chairman), C. Kerr (Vice-President), Currie, Davidson, Gibson, Lunan, and Maben.

Pharmaceutical Society of Ireland.—Messrs. G. D. Beggs (Vice-President), Conyngham, and Wells, jun.

Aberdeen and North of Scotland Society of Chemists and Druggists.—Messrs. Johnston, Kay, and Paterson.

Brighton Association of Pharmacy.—Messrs. W. H. Gibson (President) and W. W. Savage.

Leeds Chemists' Association.—Messrs. R. Reynolds (President) and G. Ward.

Liverpool Chemists' Association.—Messrs. Conroy, Smith, Symes, and A. S. Buck.

London Chemists' Assistants' Association. — Messrs. Gane, Harrison, Jones, Parry, and Strother.

Sunderland Chemists' Association. — Messrs. Harrison and Ranken.

Manchester Pharmaceutical Association.—Messrs. Cooper, Kemp, and Johnstone.

Nottingham and Notts Chemists' Association.—Mr. C. A. Bolton.

Glasgow and West of Scotland Pharmaceutical Association.—Messrs. W. L. Currie (President) and A. Kinninmont.

Midland Pharmaceutical Association.—Messrs. R. D. Gibbs (President), F. G. Gibson (Vice-President), Prosser, Alcock, Perry, A. Southall, C. Thompson, H. Hutton, W. Jones, J. Barclay, J. Liverseege, and C. F. Jarvis.

Western Chemists' Association of London.—Messrs. Martindale, J. H. Mathews, and R. H. Parker.

Bournemouth Chemists' Association.—Messrs. Bridge (President), Hardwick, Toon, Spinney, and Bilson.

Cambridge Chemists' Association.—Mr. R. S. Campkin.

Letters of Apology for Absence.

Mr. Secretary Ransom reported that letters of regret for non-attendance had been received from Mr. F. B. Benger (Manchester), Mr. E. C. C. Stanford (Dalmuir), Mr. Peter Boa (Edinburgh), Mr. Ebert (Chicago), Mr. N. M. Grose (Swansea), Mr. E. F. Harrison (Newcastle), Mr. Walter Hills (London), Mr. J. C. C. Payne (Belfast), Mr. L. Siebold (Manchester), and Mr. Peter MacEwan (London).

Mr. W. A. H. Naylor (Hon. Gen. Sec.) then read the report of the Executive Committee.

Report of the Executive Committee.

In presenting the thirty-first annual report, your Committee is glad to be able to state that general interest in the work of the Conference shows no sign of diminution. Increased membership is still, however, a desideratum, for although the last two annual meetings have been exceptionally well attended, the number of enrolled members represents no marked increase.

With the view of bringing the Blue List up to date, it has been completely revised by a sub-committee appointed by your Executive. Several new subjects have been introduced, the majority of which are specially adapted for investigation by pharmacists, while others which have been exhausted, or do not appear of sufficient importance, have been expunged. The form of the circular has also been subjected to some modification. Only one application for a money grant in aid of research has been received during the year, the sum of £3 having been granted to Mr. H. Bowden in furtherance of his investigation of *Hemidesmus indicus*. Mr. R. A. Cripps has been unable during the year to continue his work on ipecacuanha, for which grants have been previously made to him, but he hopes shortly to resume his examination of this drug. Mr. W. Elborne, B.A., who was last year the recipient of a grant, is also unable at the present time to supply a further instalment of his work on coto bark.

The Conference has lost by death several valued members during the past year. Of these, Professor Bentley was probably the most widely known. He was one of the founders of the Conference, and filled the office of President for two consecutive years—at Nottingham in 1866, and at Dundee in 1867. His long association with pharmacy as a professor, and his devoted enthusiasm to botany, brought him into contact with distinguished men from all parts of the world. His treatises relating to botany and materia medica have long been and still are justly valued. In the last annual report reference was made to the resignation of Mr. R. H. Davies, as Honorary Treasurer of the Conference, owing to prolonged illness. In recognition of his services he was last year elected a Vice-President. To the deep regret of his numerous friends the illness terminated fatally, and in December last your Committee had the melancholy duty of directing that a letter of condolence be sent to Mrs. Davies in her bereavement. Mr. Davies was a frequent contributor to these meetings, and his papers on various chemical subjects bespeak a mind that was imbued with the true spirit of science.

Professor J. M. Maisch, of Philadelphia, an honorary member of the Conference, and the author of valuable pharmaceutical works, also died last autumn, shortly after receiving the Hanbury medal. For twenty-six years he acted as permanent Secretary to the American Pharmaceutical Association. Lastly, we have to record the loss of Mr. W. D. Savage, of Brighton, a veteran pharmacist and former Vice-President of the Conference, whose death took place.

only a few weeks ago. Through the decease of Mr. R. H. Davies, a vacancy occurred in the Vice-Presidency, to fill which your Committee elected Mr. J. H. Mathews, of London. Two honorary members have also been elected during the year, Professor Joseph P. Remington, of the Philadelphia College of Pharmacy, and Dr. Anton von Waldheim, President of the Gremium of Pharmacists of Vienna.

Mr. Louis Siebold, F.I.C., F.C.S., was reappointed editor of the *Year-Book*, and the MS. of parts I.–IV. inclusive is now in the hands of the printers. It is believed that the earlier publication of the volume, to which reference was made last year, has been appreciated by members generally.

The reception by the President was held in the Christ Church Hall last night. This and the conversazione which followed were largely attended, and much appreciated by members of the Conference and their friends.

FINANCIAL STATEMENT FOR THE YEAR ENDING JUNE 30TH, 1894.

The Hon. Treasurer in Account with the British Pharmaceutical Conference.

1893.	DR.	£ s. d.	£ s. d.
July 1.	To Assets forward from last year:—		
	„ Balance in hand at Bank		34 10 7
	„ Cash in Secretary's hands		1 2 8
	„ Messrs. Churchill's Account		85 16 5
1894.			
June 30.	To Sale of *Year-Book* by Publishers . . .		20 0 0
	„ Advertisements, 1893 volume .	80 8 3	
	„ „ 1892 „ .	1 14 0	
			82 2 3
	„ Members' Subscriptions, Amount received from July 1, 1893, to June 30, 1894		435 8 10
	„ Index Book, Sales by Publishers .	0 0 0	
	„ „ „ Secretary .	0 7 6	
			0 7 6
	„ Liabilities on Outstanding Account:—		
	Messrs. McCorquodale & Co. .	3 15 6	
	Messrs. Butler & Tanner .	1 18 7	
			5 14 1
	„ Unofficial Formulary, Sales by Publishers		3 12 0
	„ Unused Cheques		0 7 2
	„ Sundries		0 15 0
			£669 16 6

1894.	Cr.	£	s.	d.	£	s.	d.
June 30.	By Expenses connected with *Year-Book*:—						
	Printing, Binding, Publishing, etc.	262	9	8			
	Postages and Distributing	24	12	11			
	Advertising and Publishers' charges	22	8	7			
	Editor's Salary	150	0	0			
	Foreign Journals for Editor	5	17	6			
					465	3	8
	„ Unofficial Formulary:—						
	Advertising	0	5	0			
	Publishers' Commission	0	7	3			
					0	12	3
	„ Sundry Expenses:—						
	Assistant Secretary at Nottingham	10	0	0			
	Copies of President's Address	0	15	0			
					10	15	0
	„ Assist. Sec.'s Salary from July 1, 1893, to June 30, 1894	45	0	0			
	„ Rent of Office	10	0	0			
					55	0	0
	„ Blue List, Printing	3	15	6			
	Postages	2	11	8			
					6	7	2
	„ Postages				11	14	7
	„ Printing and Stationery				17	9	0
	„ Bank Charges, as per Bank Book				1	4	4
	„ Petty Cash Expended				5	19	5
	„ Liabilities of last year, since paid				3	4	6
	„ Outstanding Assets—Messrs. Churchill's Account				82	18	5
	„ Sundries				0	0	5
	„ Balance at Bank	0	10	9			
	„ Balance in Secretary's hands, for Postage, 14*s.* 7*d.*; Petty Cash, 2*s.* 5*d.*	0	17	0			
					1	7	9
	„ Grants for Research				8	0	0
					£669	16	6

The Bell and Hills Fund.

1893.		£	s.	d.	£	s.	d.
July 1.	To Balance in hand	14	13	9			
	„ One Year's Dividend on Consols	9	14	5			
					24	8	2
	By Purchase of Books for Nottingham				9	7	11
					15	0	3
	Assets:—						
	Cash—Balance at Bank	15	0	3			
	Consols	360	0	0			

Examined and found correct { J. WILFORD, C. CLAYTON, } Auditors.

The Treasurer (Mr. JOHN MOSS) being called upon to read the financial statement, said he must first say a word in reference to his predecessor, the late Mr. R. H. Davies. He thoroughly agreed with everything which had been said by the President, and in the report of the Executive. Knowing Mr. Davies personally for a great many years, he knew how true those words were. He was a most painstaking man, a man of great accuracy and minuteness, and in every way a man of science; one who knew thoroughly every subject on which he professed to speak. With regard to the financial statement, it showed to some extent the depression which had been such a marked feature lately in all parts of the world, but not so much as might have been feared. For a voluntary body representing the professional, scientific, and social side of pharmacy to pursue its course so evenly was evidence of a strong desire on the part of pharmacists as a body for something which merely commercial questions could not satisfy. Still, the number of members was not satisfactory, and many thought that if they had better means of making known the advantages which the Conference could confer on individual pharmacists, the number would represent not 10 per cent., but more like 50 per cent., of the pharmacists in the United Kingdom. If ever that could be accomplished they would be able to do a great deal more good, and many publications which now had to be charged for might be given to the members free. The great thing to aim at was for each member to act as an apostle, and bring in new disciples.

The PRESIDENT having certified that the accounts had been duly audited, moved the adoption of the report and financial statement.

Mr. UMNEY seconded the motion, which was carried unanimously.

THE UNOFFICIAL FORMULARY COMMITTEE.

Mr. MARTINDALE next read the report of the Unofficial Formulary Committee, as follows:—

To the British Pharmaceutical Conference in session.

Since our last meeting the Committee have, with the sanction of the Executive, produced a new issue of the "Unofficial Formulary," which is now ready for sale. They have added four new formulæ, viz.:—*Collodium Stypticum*, *Extractum Belladonnæ Folii Alcoholicum*, *Liquor Bromo-Chloral Compositus*, and

Syrupus Acidi Hydriodici. Several alterations and corrections have been made, which further experience of the preparations had rendered necessary. These consist principally in lessening the acidity of some of the syrups, thereby rendering them more stable and palatable, and in an improved formula for *Collodium Belladonnæ*. The latter presented difficulties in the way of preparing it from a liquid extract sufficiently concentrated to be stable. They have overcome these by using a solid alcoholic extract of belladonna leaf, which must be assayed at the time of preparing the collodion, so as to obtain an uniform product.

WM. MARTINDALE, *Chairman of the Formulary Committee.*

The reading of papers was then proceeded with, the first two being considered together. One was read by Mr. Farr and the other by Mr. Wright.

NOTE ON THE STABILITY OF THE ALKALOIDAL TINCTURES.

BY E. H. FARR AND R. WRIGHT, F.C.S.,

Pharmaceutical Chemists.

The question of the stability or otherwise of galenical preparations like tinctures is of considerable importance from a medical and pharmaceutical standpoint, because it is evident that in so far as such preparations are liable to undergo alteration in composition, either through the separating out of any of the principal constituents, or through changes taking place in the characters and properties of any of the active principles, by so much will the preparations themselves be rendered uncertain in strength and, consequently, unreliable in effect. The question assumes an added importance on account of the present disposition of opinion in favour of standardised preparations; and still more so in view of the fact that it is more than probable that the publication of the forthcoming edition of the British Pharmacopœia will witness a considerable extension in the application of the principle of standardisation to preparations of potent drugs.

Now, if it were proved impossible to keep a preparation up to standard strength after being standardised, this fact would in itself constitute a great, if not an insuperable barrier in the way of carrying out any such system of standardisation as we have advocated for several years past. During the progress of our

Table showing Results of Determinations of Alkaloidal Tinctures.

Tincture.		Date of First Estimation.	Percentage of Alkaloid.	Date of Second Estimation.	Percentage of Alkaloid.
Aconite	1	Jan. 6, 1891	·054	March, 1894	·054
	2	Jan. 9, 1891	·050	Dec. 7, 1893	·048
	3	Jan. 9, 1891	·066	Dec. 8, 1893	·060
Average		—	·056	—	·054
Belladonna	1	Aug. 18, 1891	·024	March, 1894	·024
	2	Aug. 18, 1891	·026	March, 1894	·025
	3	Aug. 24, 1891	·039	Nov. 14, 1893	·039
	4	Aug. 24, 1891	·038	Nov. 14, 1893	·038
Average		—	·032	—	·032
Cinchona	1	March, 1893	1·29	April, 1894	1·27
	2	March 27, 1893	1·00	Feb. 22, 1894	·95
Average		—	1·14	—	1·11
Colchicum	1	Nov. 11, 1890	·096	April, 1894	·092
	2	Nov. 14, 1890	·058	April, 1894	·058
	3	Dec. 9, 1890	·079	Dec. 21, 1893	·080
	4	Dec. 9, 1890	·080	Dec. 19, 1893	·076
Average		—	·078	—	·077
Conium	1	Oct. 6, 1890	·158	March, 1894	·154
	2	Oct. 16, 1890	·090	Dec. 15, 1893	·090
	3	Oct. 16, 1890	·098	Dec. 15, 1893	·096
Average		—	·115	—	·113
Gelsemium	1	Oct. 22, 1891	·020	April, 1894	·019
	2	Oct. 16, 1891	·047	Nov. 30, 1893	·048
	3	Oct. 16, 1891	·068	Dec. 5, 1893	·066
Average		—	·045	—	·044
Hyoscyamus	1	July 23, 1891	·012	March, 1894	·012
	2	July 23, 1891	·011	March, 1894	·011
	3	March 20, 1891	·013	Nov. 17, 1893	·0125
	4	March 20, 1891	·0135	Nov. 17, 1893	·013
Average		—	·0124	—	·0121
Jaborandi	1	Feb. 14, 1891	·112	March, 1894	·106
	2	Feb. 14, 1891	·080	March, 1894	·081
	3	Feb. 16, 1891	·134	Nov., 1893	·130
	4	Feb. 16, 1891	·140	Nov. 28, 1893	·136
Average		—	·116	—	·113
Lobelia	1	July, 1892	·028	April, 1894	·029
	2	July 22, 1892	·044	Nov. 21, 1893	·044
	3	July 22, 1892	·042	Nov. 22, 1893	·041
Average		—	·038	—	·038
Stramonium	1	Sept., 1891	·032	March, 1894	·032
	2	Sept., 1891	·030	March, 1894	·030
	3	Sept., 1891	·027	March, 1894	·028
	4	Sept., 1891	·030	March, 1894	·029
Average		—	·030	—	·030
Veratrum Viride	1	July, 1892	·184	April, 1894	·176
	2	July, 1892	·212	April, 1894	·192
	3	Dec. 15, 1891	·140	Dec. 9, 1893	·138
	4	Dec. 15, 1891	·158	Dec. 12, 1893	·150
Average		—	·173	—	·164

work on tinctures we therefore took the precaution to preserve specimens of each of the tinctures operated upon, intending, as soon as time and opportunity would allow, to turn our attention to the question as to whether or not those tinctures, the active principles of which are capable of ready and accurate determination, suffered any diminution in strength when kept for a length of time. It was also thought that inferentially the results of this inquiry might tend to throw light upon the same question in its application to other tinctures not brought under examination, or at any rate that they might not be without interest in their bearing upon that point. All the tinctures examined have been kept for twelve months at least, the majority of them for a space of two or three years. The processes employed for the determination of the alkaloids have been precisely the same as those originally followed, and will be found published in the individual papers, references to which are given in the *Year-Books* for 1890-93.

The results obtained prove that the strength of these tinctures, so far as can be judged from the determination of their alkaloidal constituents, remains approximately the same for a considerable length of time, and it may fairly be assumed that when preserved under normal conditions, such preparations remain constant in composition. The only cases in which any notable loss of alkaloid is apparent are those of the tinctures of cinchona and green hellebore; and this loss is doubtless due to the mechanical carrying out of solution of traces of alkaloid by deposited resinous and extractive matter. The average loss in the most extreme case, that of the tincture of green hellebore, does not amount to 5 per cent. of the alkaloid originally present.

GRAVIMETRIC AND VOLUMETRIC METHODS FOR THE DETERMINATION OF THE ALKALOIDS IN ALKALOIDAL TINCTURES.

By E. H. Farr and R. Wright, F.C.S.,

Pharmaceutical Chemists.

Probably the first systematic attempt to devise a method for the approximate determination of the alkaloids in galenical preparations was made by A. B. Lyons (*Amer. Journ. Pharm.*, Dec., 1886, and Jan., 1887), who recommended for that purpose the

titration of acidulated solutions of the crude alkaloids with Mayer's reagent. This process was found to have many disadvantages, and Lyons himself has admitted that the results obtained by it have at best only an approximate value. The chief drawbacks of the method are that the amount of the volumetric solution used up varies with the acidity of the alkaloidal solution, the volume of the liquid, and the amount of alkaloid present. To which must be added that most of the precipitates produced are also soluble in the mother liquor, and hence it is necessary to make a correction for the solubility of the alkaloidal precipitate. These facts have served to bring the method of titration by Mayer's solution into disrepute, and although in the hands of an analyst accustomed to work with it the process may be capable of yielding fairly accurate results, it is impossible that the use of such a process will ever become general.

A gravimetric process for the determination of the alkaloids in certain extracts and tinctures was subsequently proposed by J. U. Lloyd (*Proc. Amer. Pharm. Assoc.*, 1891). This consists in mixing a measured volume of the preparation to be assayed with ferric chloride, adding to the mixture a sufficient quantity of sodium bicarbonate to form a magma, and extracting the alkaloid with chloroform. In some cases a process of purification was recommended, which consisted in shaking out the alkaloids with acidulated water, rendering the solution alkaline, and extracting with chloroform. Lloyd's assay process was very severely criticised by J. B. Nagelvoort, and there is no doubt that the figures obtained by this process are liable to be as much below the mark as those yielded by that of Lyons are above it.

In 1889 a series of papers on tinctures was published by F. W. Fletcher (*Chemist and Druggist*, January, 1889), in which definite proposals were made for the fixing of minimum standards of strength for tinctures containing alkaloids, and processes for the isolation and gravimetric determination of the alkaloids were given.

A. H. Allen, in his *Handbook of Commercial Organic Analysis* (2nd edition, vol. iii., part ii., p. 131), has recommended a process of titration, the crude alkaloid, obtained by shaking out, being dissolved in ether or chloroform and the solution titrated with $\frac{HCl}{50}$, methyl orange being used as indicator; and in a paper on neutrality, read before the London Chemists' Assistants' Association (*Pharm. Journ.* [3], xxii. 774), also gave a useful table, show-

ing the behaviour of the more important alkaloids towards methyl orange, phenol-phthalein, and litmus.

The subject of the titration of alkaloids has also been dealt with by R. A. Cripps (*Pharm. Journ.* [3], vol. xxii. p. 511), who, in a valuable contribution to the literature of the subject, has shown how, by the aid of delicate indicators like methyl orange, iodeosine, gallein, etc., minute quantities of alkaloids can readily be determined. In a note published in the *American Pharmaceutical Review*, November, 1892, Professor C. Caspari maintained that the alkaloidal residues yielded by gravimetric methods invariably contained from 10 to 20 per cent. of impurities, and asserted the marked superiority of volumetric processes of determination. He advocated a process consisting in the solution of the crude alkaloid in excess of $\frac{HCl}{10}$, and titrating back with $\frac{N}{100}$ alkali, using Brazil wood as indicator. Lastly, in a paper read before the American Pharmaceutical Association last year, entitled "The Value of Titration with Volumetric Acid Solution as a Means of Assaying Drugs and Galenical Preparations," Messrs. Caspari and Dohme have claimed to show that the determination of alkaloids in galenical preparations may be effected more accurately by titration than by the usual plan of weighing.

As during the course of our work on the subject we have employed gravimetric processes of determination almost exclusively, it appears to us absolutely necessary to test the conclusions advanced by Caspari and Dohme, in order to ascertain whether they had any foundation in fact. With this object in view, each of the alkaloidal tinctures previously submitted to examination was prepared in quantity sufficient to admit of the determination of the alkaloids being carried out by the following processes :—

1. Two gravimetric determinations by methods described in our notes on tinctures.
2. The tincture was evaporated, the residual liquor rendered alkaline, and the alkaloid extracted with chloroform. Except in the cases of veratrum, lobelia, and colchicum, the alkaloid was once purified by shaking out with acidulated water, rendering the solution alkaline, and again extracting with chloroform. The chloroformic solution was then washed with a little distilled water before being titrated. When ammonia was used as a precipitant of the alkaloid, the washing was repeated until the water, on separation, ceased to become pink on addition of phenol-phthalein. The

chloroformic solution thus obtained was utilised for the direct titration of the alkaloids with $\frac{HCl}{20}$, methyl orange, iodeosine, and phloxine being used as indicators in the separate experiments. In using methyl orange, a little distilled water is added along with two drops of the indicator; but with iodeosine or phloxine a single drop of a $\frac{1}{1000}$ solution is sufficient, and this is shaken up with the chloroformic solution until the chloroform has become distinctly coloured. The indication of the end of the reaction is, in the case of methyl orange, the appearance of a slight pink colour in the aqueous layer, and where iodeosine or phloxine is employed the decolorisation of the chloroform marks the end of the reaction.

3. The alkaloid as obtained by the usual gravimetric process was dissolved in a calculated excess of standard acid (usually 4 or 5 c.c.), the indicator added, followed by the addition of standard Ba 2 H O until the neutral point was reached. These determinations are preferably made in a white porcelain dish in which the alkaloid has previously been obtained; the slight changes in colour are thus more easily recognised.

The indicators used were methyl orange and Brazil wood, supplemented where the volume of the tincture available would allow by iodeosine and phloxine. In this case the indication of the end of the reaction, when methyl orange is employed, is the disappearance of the pink tint, and with Brazil wood the production of a purple colour. In the employment of iodeosine and phloxine as indicators, except in direct titration, we have followed the plan recommended by Cripps in the paper referred to above, of adding to the acid alkaloidal solution sufficient neutral ether to leave a distinct supernatant layer when shaken up with the solution. The indication of the end of the reaction is the production of a pink tint in the lower layer. In the determinations, the results of which are recorded in the table, $\frac{N}{20}$ hydrochloric acid has been employed, as an acid of this strength will be found generally suitable for use in determining alkaloidal residues from tinctures. A standard acid of this strength will also keep indefinitely. Of the alkalies, barium hydrate is undoubtedly by far the most suitable, both because it gives a quicker reaction than potassium or sodium hydrate, and also because the absorption of

carbon dioxide is soon evidenced by the turbidity of the solution. The exact strength of the solution employed is not very material, so long as its value in terms of the standard acid is known; and owing to the facility with which it absorbs carbon dioxide from the air, it is necessary to ascertain its neutralising power before each determination. It is, perhaps, not advisable to work with a stronger solution than one of $\frac{N}{50}$ strength. Each c.c. of such a solution will contain ·00171 gm. $Ba2HO$, and will neutralise 0·4 c.c. $\frac{HCl}{20}$.

The following were the indicators used:—

Methyl Orange.—A tincture containing 1 grain of methyl orange dissolved in a fluid ounce of proof spirit.

Brazil Wood.—The U.S.P. test solution. This is made by boiling 50 grammes finely cut Brazil wood with 100 c.c. distilled water for half an hour, replacing the water lost from time to time. The mixture is allowed to cool, the liquor strained off, water added to 100 c.c., and a further addition made of 25 c.c. alcohol, and the whole filtered.

Iodeosine and Phloxine.—An aqueous solution containing 1 part in 1000 fluid parts.

The following is the list of the equivalents from which the results recorded in the table have been calculated.

Tincture of			Alkaloid.
Aconite	1 c.c. $\frac{HCl}{20}$	= ·03225 Gram.	Aconitine.
Belladonna, Stramonium, Hyoscyamus	1 c.c. $\frac{HCl}{20}$	= ·01445 Gram.	Atropine or Hyoscyamine.
Cinchona	1 c.c. $\frac{HCl}{20}$	= ·0154 Gram.	mixed Alkaloids.
Gelsemium	„	= ·0183 „	Gelsemine.
Conium	„	= ·00625 „	Conine.
Opium	„	= ·01425 „	Anhydrous Morphine.
Jaborandi	„	= ·0108 „	Pilocarpine.
Nux vomica	„	= ·0182 „	Mixed Alkaloids.
Lobelia	„	= ·01425 „	Lobeline.
Veratrum	„	= ·0253 „	Mixed Alkaloids.
Colchicum	„	= ·0165 „	Colchicine.

In the case of cinchona, nux vomica, and veratrum, the equivalents are calculated by taking the mean of the molecular weights of the chief alkaloids.

The results obtained are embodied in the accompanying table (see page 351).

Notes on Results.

1. Volumetric methods appear useless for the determination of the alkaloids of aconite, the large proportion of aconine present (equivalent ·02715) making the readings much too high.
2. They are also useless in the case of preparations of colchicum, which appears to contain a small percentage of an alkaloid having definite basic properties, probably colchicine, with a considerable proportion of some other possibly equally active but chemically indifferent substance.
3. Gelsemium contains two alkaloids, gelsemine and gelseminine, the former crystalline, the latter amorphous. Gelseminine is said to be present in the drug only in small proportion. The formula of gelsemine has been given by Gerrard as $C_{21}H_{28}N_2O_4$, by Sonnenschein as $C_{22}H_{38}N_2O_4$, by Cushing as $C_{49}H_{63}N_5O_{14}$, while the latest researches of L. Spiegel cause him to hesitate between the formula given by Gerrard and the alternative formula, $C_{22}H_{26}N_2O_3$, with which some of the results of his experiments agree better.

The figures given in the table are calculated upon the basis of the alternative formula of Spiegel.

4. The titration of the cinchona bases is attended with great difficulty, owing to the end reaction being almost unobservable. With extreme care fairly accurate results may be obtained, but our experience with this tincture has been such as to cause us unhesitatingly to condemn the application of any volumetric process to the assay of this tincture. In several instances the results indicated by titration were exactly twice as great as those obtained by weighing.
5. The volumetric determinations of the alkaloids in the tinctures of veratrum examined yielded results approximating very fairly to those of the gravimetric determination; but the formula weights of the alkaloids of veratrum differ so widely that such comparative accuracy could by no means be generally relied upon.
6. The tinctures which lend themselves most readily to determination by titration are those of belladonna, henbane, stramonium, conium, jaborandi, lobelia.

Table showing Comparative Results obtained in Determining Tinctures (a) *Gravimetrically and* (b) *Volumetrically.*

Tincture.		Alkaloid by weight mean of two experiments.	Alkaloid indicated by direct titration of chloroformic solution with $\frac{H\,Cl}{20}$.			Alkaloid indicated by dissolving crude alkaloid in excess of $\frac{H\,Cl}{20}$ and titrating back with $\frac{Ba\,2H\,O}{100}$.			
			Methyl Orange	Iodeosine.	Phloxine	Methyl Orange	Brazil Wood.	Iodeosine.	Phlosine.
Aconite . . .	1	·013	—	·018	·019	·020	—	·018	·018
	2	·014	·020	·019	·022	·022	·022	·022	·025
Belladonna . .	1	·022	—	·022	·022	·022	·021	·020	·020
	2	·031	·033	·032	·034	·031	·032	·032	·030
Cinchona . .	1	·074	—	·144	·145	·078	—	·072	·071
	2	·087	·093	·087	·086	—	·052	—	—
Conium . . .	1	·047	—	·042	·042	·042	·042	·042	·042
	2	·024	·024	·024	·023	·024	·023	·024	·024
Colchicum . .	1	·024	—	—	—	·005	—	—	·005
	2	·028	—	—	—	·006	—	·005	—
Gelsemium . .	1	·019	—	·018	·019	·019	·017	·018	·018
	2	·024	·024	·020	·021	·027	·024	·024	·024
Hyoscyamus .	1	·005	—	·005	·005	·005	·005	·005	·005
	2	·009	·010	—	·0085	·008	·008	·008	·0086
Jaborandi . .	1	·020	—	·018	·018	·017	·017	·017	·017
	2	·018	·018	·017	·017	·018	·018	·017	·018
Lobelia . . .	1	·009	—	·009	·008	·008	·008	·008	·008
	2	·009	·008	·009	·009	·007	·008	—	—
Nux Vomica .	1	·043	—	·044	·043	·043	·042	·041	—
	2	·066	·066	—	—	—	·066	·066	·065
Opium* . . .	1	·100	—	—	—	·095	·094	·095	·094
	2	·100	—	—	—	·099	·099	·097	·099
Stramonium .	1	·011	—	·011	·011	·011	·011	·010	·010
	2	·017	·017	—	—	·017	·017	·016	—
Veratrum Viride	1	·023	—	·023	·022	·019	·020	·019	—
	2	·027	·027	·020	·023	·023	·021	·024	·019

Nux vomica and opium (for morphine). As a general process the following method of determination is put forward with some degree of confidence as one which would, we think, be found in

* For the opium determinations a solution of anhydrous morphine obtained in estimating the tincture by the B.P. process was employed; this was dissolved in excess of $\frac{N}{20}$ H Cl.

N.B.—Instead of dissipating the chloroform from the chloroformic alkaloidal solution by means of a gentle heat, and dissolving the alcohol in $\frac{N}{20}$ H Cl, the alkaloid may be determined by shaking out with a measured excess of $\frac{N}{20}$ H Cl, and titrating back with $\frac{Ba\,2\,H\,O}{50}$.

some cases almost equally reliable and somewhat more expeditious than gravimetric processes. "From 25 to 50 c.c. (in the case of hyoscyamus 100 c.c.) of the tincture to be determined is introduced into a porcelain dish and evaporated over a water-bath, with addition of water if necessary, until all alcohol has been driven off. The residual extract is acidified and filtered through cotton wool into a stoppered separator, the dish and filter being washed with acidulated water, and the washings added to the contents of the separator. The acid liquid is then shaken with two successive portions of chloroform, and the latter drawn off. The separated chloroform is washed with a little acidulated water, and after separation the latter is removed and added to the contents of the separator. The liquid in the separator is then made alkaline and the alkaloids taken out by shaking with three successive small quantities of chloroform. The chloroformic solutions are drawn off into a cylinder provided with a good cork, and when ammonia has been employed as the precipitant, washed with distilled water until the washings cease to give a pink tint with phenol-phthalein. A drop of $\frac{1}{1000}$ iodeosine solution is then added, and the whole well shaken until the chloroform is distinctly tinted, $\frac{HCl}{20}$ is then carefully run in from a burette graduated to tenths of a c.c., the mixture being well shaken after each addition of the acid until the colour is discharged from the chloroform. The reading is now taken, and the amount of alkaloid calculated from the proper equivalent. This process is not applicable to tincture of lobelia, the alkaloid from which must be obtained in ethereal or chloroformic solution by the process published in the *Chemist and Druggist*, vol. xlii., p. 464. It is only necessary to say, in conclusion, that while we admit that the application of volumetric methods of determination to the alkaloids obtained from tinctures is sometimes useful as affording a check upon the results obtained by gravimetric methods, we still maintain that the results yielded by the latter are, if anything, the more reliable of the two. And while the former may be more in favour with scientific chemists and thoroughly competent analysts, the latter are the processes for the practical pharmacist.

The PRESIDENT said these papers were very valuable, but would have been much more so if the authors had prepared large diagrams containing the tables referred to.

Mr. WRIGHT said he took the trouble to do this last year, and was rather surprised to find that no one attempted to make any use of the diagrams, which he had spent many hours in preparing.

Mr. UMNEY said there were three things quite clear: first, that this paper could not be discussed, because it covered such a vast field that it was impossible to take it in on merely hearing it, and though he sympathised with Mr. Wright, he must say that the tables would have been of some service in following the paper. In the next place, pharmacists throughout the world were very much indebted to the authors for having cleared up matters which had been in doubt for years. They had been using tinctures of belladonna, henbane, colchicum, cinchona, etc., without being at all sure whether they were at all uniform in strength, or whether their potency could be at all accurately determined, but they had now, as the result of an immense amount of experiment, some definite information on these matters. Thirdly, they had a definite opinion that at least ten or a dozen of these tinctures could be standardised, and he hoped when the new pharmacopœia came out, the leading tinctures which physicians were accustomed to prescribe would be put in a standardised form, so as to be at any rate a little in advance of the pharmacy of the last half-century.

Mr. MARTINDALE also spoke of the great importance and interest of these papers, especially as regarded the keeping properties of tinctures. As far as he gathered there were two which did lose a notable amount of their properties on keeping, one of which he thought was conium.

Mr. WRIGHT said conium was fairly stable, the two he specially mentioned were cinchona and veratrum.

Mr. MARTINDALE said he was going to suggest that in those cases an acetic tincture might be made. In the case of conium, if that were found to change, the alkaloid might be fixed by acetic acid, but that might not apply to cinchona. He agreed that in many cases the gravimetric method of analysis was superior to the volumetric for this reason, that, as Mr. Umney once said, he believed in what he could see and weigh, and, he would add, in what could be crystallised; or if the percentage could not be given in crystallisable salts or alkaloids—as in the case of jaborandi, which contained a liquid alkaloid, likely to be contaminated by the so-called principle jaborine, which might itself be a derivative from the decomposition of pilocarpine—yet at all events the crystallisable salt, the nitrate, was insoluble in alcohol, and a process might be devised for getting that crystallisable

body in a definite condition and weighing it, if the percentage of liquid alkaloid were at all doubtful.

Mr. GROVES said he would like to know the exact conditions under which the tinctures were kept. He would also remark that many of these drugs contained more than one alkaloid, and that these varied in strength, and some had no activity at all, so that the mere determination of the total alkaloids, though useful for some purposes, did not indicate the activity of the drug.

Mr. PARKER asked if any investigation of vinum colchici had been made by the authors.

Mr. MOSS agreed with the President as to the great desirability of having diagrams of the tables in such papers; they assisted the mind, and obviated a great strain on the memory in endeavouring to follow the paper. Even if the diagrams were not referred to last time, he had no doubt they were of great assistance. Mr. Martindale had drawn attention to the great constancy of these tinctures after being kept two or three years, which was very striking. This, of course, only referred to the total amount of alkaloids, whether determined gravimetrically or volumetrically, and did not touch the point raised by Mr. Groves as to their activity. Another point to which his attention was directed was the different results obtained with regard to tincture of colchicum by the two methods. In the first paper he thought the initial strength of the tincture of colchicum, No. 1, was about twice that of No. 2; and although the two tinctures remained constant, he thought the difference between the two strengths suggested a difference in the character of the drug from which they were prepared; probably they were from different samples, or from different sources. He wished to add his testimony to the infinite pains the authors must have taken over a long period to produce these results.

Mr. ALCOCK asked if the tinctures on re-examination were found pure and bright. They all knew that there was often a deposit in a tincture some time after it was prepared, and the question of what was contained in that deposit might be cleared up if it were found that the alkaloidal tinctures remained bright, or if a loss of alkaloid accompanied the appearance of sediment.

Mr. SYMES thought, on the whole, the results adduced seemed to show that the volumetric method was reliable, and might even be of value in checking the gravimetric method.

Mr. LLOYD WILLIAMS said in many cases one could not determine a tincture by the volumetric method, because the actual

composition of the salts was unknown, and the probable composition varied so much that there was no absolute certainty about the method, and he preferred the gravimetric. In that there was something which could be seen, and was in a state of tolerable purity. In neither case could you determine the absolute quantity of material present, but you could certainly get results which, if the investigator used the same methods, were comparable amongst themselves. In making volumetric determinations of tinctures, he had found that extreme difficulty arose in dealing with different samples unless he always standardised against a practically pure salt of known composition, and always kept to it as the standard of comparison.

Mr. CONROY said he had a great admiration for the immense amount of work which the authors must have gone through, and he was very pleased to hear that after going through this stupendous labour they found, on re-examination of the tinctures, that they practically retained their full strength. He would suggest that if on a future occasion the tests were repeated, it would be well to test the deposits also in the case of cinchona and veratrum. They might then be able to say definitely whether the deficiency was due to decomposition or dissipation.

Mr. GERRARD was very pleased to find that the tinctures maintained their character so well, as it would tend to give the medical profession confidence in prescribing them. In many cases they possessed advantages over the pure alkaloidal preparations, in that they contained the constituents of the drug in the natural state of combination. With regard to the comparative merits of the gravimetric and volumetric methods, he was rather in favour of the latter, for this reason:—In working, as the authors had done, on a small quantity of material, taking 25 or 50 c.c. of tincture and evaporating to an extract, it required very careful work indeed to deal accurately with such a small quantity. He knew, from some amount of experience, what difficulties occurred in getting the pure residue to titrate from, and unless they titrated the residue side by side with the pure base, as suggested by Mr. Williams, he felt sure they would include in the residue some foreign bodies. It was not easy to get an absolutely pure residue from such small quantities, and if it contained a little resinous or changed matter of some description, and you dissolved it in a solvent, treated it with an acid, and neutralised it, what you neutralised was only the alkali, and what you weighed might be something other than the base. He would ask the

authors whether they weighed or measured the tincture previously to the examination, because the difference in the two processes might account for slight differences in the results. They had spoken of the different figures obtained in the case of gelsemine to those obtained by himself, but he thought that might be fairly accounted for by the fact that they were working with small quantities, whilst he worked with as much as ½ cwt. of material, and even then he found it exceedingly difficult to obtain the alkaloid in a pure white condition. He could easily imagine that with the small quantities they used there would be a difference in the figures.

The PRESIDENT said he should like to emphasise what had been said as to the gratitude they all owed to Messrs. Farr and Wright for their work, especially as it was work which did not appeal to everybody, for it required great patience and determination to go on making experiment after experiment without obtaining any brilliant results. The first paper on the stability of alkaloidal tinctures was very valuable; but with regard to the second one, he did not think the results of the experiments altogether warranted the strong condemnation of the volumetric method of determination for cinchona. In the first case the alkaloid by the gravimetric method gave ·074, and by the other method ·144 and ·145; in the second experiment the weight by the gravimetric method was ·087, and by the same reagents ·087 and ·086, so that it looked as if there were something wrong somewhere. In the first experiment the result by the volumetric method was nearly double, and in the other they were nearly identical. That could hardly be taken as a conclusive experiment. He agreed with Mr. Groves that it was not easy to fix the clinical value of a tincture by the amount of one alkaloid present. He was not quite sure that they could be perfectly certain of having that alkaloid in a pure form, or that they always knew which was the important one. In the case of the aconitine products there was a difficulty in knowing exactly what you had, and in the case of gelsemine the authors themselves said there was a considerable difficulty in this matter. But this did not detract from the value of the investigation as far as it went.

Mr. WRIGHT, in reply, said he quite agreed that it was impossible to ascertain the exact clinical value of a tincture by determining the alkaloids it contained; all they contended for was that if you knew the exact amount of alkaloid it would yield, and fixed a minimum standard of alkaloid for it, there was a far better

guarantee for the clinical value than under the haphazard method of making tinctures which had been followed up to the present time. With regard to the comparative value of gravimetric and volumetric processes for the determination of alkaloids and alkaloidal residues, he was inclined to agree with Mr. Gerrard, especially in the case of gelsemine. In the case of several tinctures they employed the same method, and got some very peculiar results, first of all an alkaloid which had exactly the saturate base of Mr. Gerrard's gelsemine, and on adding chloroform after exhausting the tincture with ether they got a further quantity which had a saturating power considerably in excess of that obtained by using ether. That went to prove that there were two separate alkaloids in gelsemium, one having the molecular form stated by Gerrard, and another having a lower molecular weight. This was a subject which required further investigation, and he had, in fact, commenced upon it. Mr. Martindale suggested the use of acetic acid in making tincture of conium to fix the alkaloid, but in conium the alkaloid was already fixed. In fact, in his own opinion, this was one of the most stable tinctures, although the alkaloid was said to be volatile. He believed it existed in combination with some organic acid. The tinctures were not kept in any special way; some were in full bottles, some partially so, many in the laboratory, some in the cellar—no special precautions were taken. With regard to colchicum wine they had made no special investigation, but he recently ascertained for a medical man that the tincture of colchicum was slightly stronger than the wine, and contained rather more of the active principle; probably the tannin in the wine fixed some of the alkaloid. With regard to Mr. Moss's remark on the subject of the diagrams last year, he was glad to find that they produced more impression on friends at a distance than they appeared to do on those present. Generally speaking, the tinctures were pure and bright; in the case of cinchona and veratrum there was a deposit, and no doubt the slight loss of alkaloid in those cases was due to the fact that some was carried out of solution by the depositing matter. He was inclined on the whole to maintain that the gravimetric process was more reliable than the volumetric, with this caution, that there was, in one or two cases, the greatest difficulty in getting rid of the last trace of resinous matter. In the case of gelsemium there was some colouring matter present which they had to devise a special process for getting rid of; it was certainly not an acid resin, and there were two other tinctures in which

the same difficulty occurred. In veratrum the resinous matter clung most persistently to the alkaloid; and if further work showed that the volumetric method was reliable in this case, he should admit that it had the advantage. The same with regard to lobelia; the alkaloid there was combined in some very peculiar manner with some other substance, and it was very difficult to get the alkaloid. The advantage of the gravimetric method was that when you saw a substance you knew you had it, but, on the other hand, when you weighed, you weighed everything you had, and if there were any foreign matter present that was included. They had condemned the volumetric method for cinchona because they obtained results just double those obtained in the other way.

A vote of thanks was accorded to the authors for their papers.

THE QUALITIES OF A TYPICAL DENTIFRICE.

By Arthur Turner, F.C.S., L.D.S.

By a typical dentifrice we mean one adapted to general use, in contradistinction to powders having special properties, prescribed for use in special cases.

In building up our powder, we have first to look for a mechanical base which shall be capable of cleansing the surface of the tooth, without the possibility of doing any chemical or mechanical damage to its structure.

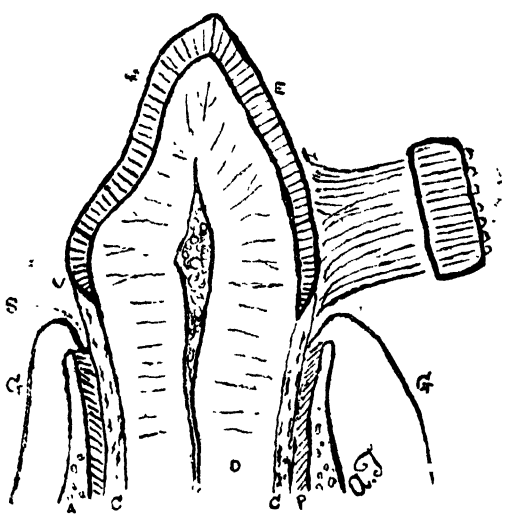
We must bear in mind that the enamel, though the hardest and densest tissue in the body, is not impregnable, and that the edge of the enamel-cap is bevelled off, so to speak, becoming thinner as we approach the gum. At the neck of the tooth there is often no enamel at all, and consequently, whatever dentifrice is used will here come into contact with a more vulnerable structure—the cementum of the surface of the root. We are here referring to a normal healthy tooth. Let us take care that our mechanical base is of such a nature that its constant use can do no harm to this more delicate part.

Now, we contend that the presence of pumice-stone in the base, even if used in small proportion and finely ground, cannot fail to do damage here as well as to the thinner parts of the enamel-cap; the hard angles of its particles scratch the surface of the tissues and wear them away.

Charcoal, as a base, is objectionable on account of its colour—it is liable to accumulate in the sulcus between the gum and the cementum, forming an unpleasant-looking dark line.

We are compelled, then, in choosing a base, to fall back upon our old friends, the chalks of the Pharmacopœia. These fulfil as accurately as possible the required duty.

We really clean our teeth, then, just as we do our silver and plated goods; we have not yet found a better way. Indeed, to test the quality of our mechanical base, we might do worse than to clean a new silver spoon with it, and then with the aid of a



Section of Crown of a Sound Canine Tooth and adjacent structures, with soft tooth-brush applied:—E, Enamel-cap; C, Cementum; D, Dentine; P, Alveolo-Dental Periosteum; A, Alveolar Bone; G, Gum; V, Specially vulnerable part, even in a healthy tooth; S, Sulcus between gum and neck of tooth, in which there is danger of *débris* of powder or food collecting.

lens examine the surface of the silver to see whether it has been cut. If it has suffered injury, let us by all means try to find a softer base.

To follow out the plate-cleaning idea, one might, after cleaning the fronts of the incisors, give them a final dry polish with wash-leather.

On comparing the claims of the official chalks, we much prefer the creta præparata to the creta præcipitata; for every particle of

the former has been suspended in water by virtue of its own lightness, whereas every crystal of the creta præcipitata has been thrown down from a condition of semi-suspension in a denser fluid by means of its own greater density. It may be contended that the precipitated form is not entirely or exclusively crystalline, but it will be admitted that it is composed largely of crystals.

The mention of crystalline calcic carbonate makes us think of it in its native form—white marble; and who would think of cleaning a delicate structure with a powder having physical properties in any degree like those of marble?

Having satisfied ourselves by means of the official test, that our prepared chalk does not contain silica, we have a base as nearly perfect as possible.

The presence of myriads of germs in the saliva is easily proved, and there is danger that lingering traces of either solid or liquid food may become, even in the healthy mouth, both septic in influence and acid in reaction.

We do well to counteract these tendencies by giving our base an increased antacidity, and also by making it antiseptic; for it is obviously necessary for the well-being of the dental tissues that the fluids of the mouth should be kept alkaline and aseptic.

A small proportion of such an antacid as bi-carbonate of sodium gives the necessary extra alkalinity. Only a small proportion is required, because healthy saliva is itself alkaline, and our mechanical base is already slightly so.

For the antiseptic property we plead strongly for the use of oil of cinnamon. It is free from the objectionable qualities of the harsher antiseptics, such as carbolic acid or eucalyptus oil. Experiments prove it to be an efficient germ-killer. We do not think its antiseptic powers are sufficiently valued. Moreover, used in proper proportion, it is pleasant to the mouth and imparts a most delightful sensation of cleanliness and sweetness.

Should the typical dentifrice contain an astringent? We think not. Most astringents are unpleasant, and consequently should be omitted, if only for the sake of the children who will be expected to use it.

We leave the embellishing of the preparation entirely to the skill of the pharmacist. As to colour, we see no objection to whiteness. If this be unpopular, let us be careful to use only harmless and neutral tinting ingredients.

We welcome the fashion of putting up the dentifrice in wide-mouthed bottles with sprinklers, and condemn any method of

putting up in which there is a temptation to dip the wet brush into the powder.

We advise putting the fullest directions on the label. These should include the rinsing of the mouth with water after using the powder, and advice as to the use of a soft brush. Warm water is indispensable in winter, especially for children. If the dentifrice be only used once a day, bedtime is better than morning, but both are to be preferred.

Mr. GROVES (who had taken the chair during the temporary absence of the President) said the paper was a very useful one, but did not call for much comment or criticism. He did not agree with the statement that astringents should be avoided because they were unpleasant; he thought the real question was the utility of the dentifrice, and in some cases the addition of an astringent would be decidedly advantageous.

Mr. MOSS asked if silica would be considered objectionable, provided it were in the form, as in some of the infusorial earths, of very fine powder.

Mr. UMNEY said he did not know anything about tooth powder, but he denied the statement that precipitated chalk was thrown down from a condition of semi-suspension. When properly prepared it was made from two solutions—chloride of calcium and carbonate of sodium—and it was only a question of carrying these solutions to a very great dilution to get the chalk in a state of almost impalpable powder. There were all kinds of products passing under the name of precipitated chalk, which differed as much from one another as shoddy from broadcloth.

Mr. MARTINDALE suggested that unless a tooth powder had something in it to take a grip of the teeth it would not always answer its purpose. Cinnamon had been mentioned as a flavouring ingredient; but he thought many essential oils, when combined with other matters, such as carbonate of soda, would soon lose their flavour.

Mr. TURNER, in reply, said he only objected to the inclusion of an astringent as a normal ingredient. There were many cases where it was required, and then it should be supplied. If silica could be found in such a fine state that it would not scratch, he saw no objection to its use. By a condition of semi-suspension he meant that at the moment of precipitation chalk was formed; it was suspended just for the moment, but began to fall immediately,

in contradistinction to prepared chalk, which was suspended long enough to be carried away by the water. A great deal of harm was done by "gripping" tooth powders, especially those containing pumice-stone. Of course, if oil of cinnamon were used, the powders should be moderately freshly prepared.

Mr. Turner was thanked for his paper.

The Conference then adjourned for lunch.

EXTRACT OF NUX VOMICA.

By E. W. Lucas, F.C.S.

Expressions of opinion have been invited as to whether it would be desirable to replace the present extract of nux vomica by an equivalent of powdered extract in the next edition of the Pharmacopœia. The idea is not a new one, having been advocated by Duncan as long ago as 1889. The loss of moisture on keeping and the consequent increase in alkaloidal strength have been a frequent theme of discussion, and in 1891 Conroy proposed the incorporation of syrupy glucose as a means of preventing loss. Umney and Moss were rather in favour of stiffening the present extract by the addition of inert extractive matter to be obtained by a repercolation of the marc with very dilute alcohol. Now it is not an easy matter, except by the aid of an effective drying room or oven, to obtain extract of nux vomica so perfectly dry that it will powder, and even when powdered and diluted it is difficult to preserve in this state, owing to its very hygroscopic nature. Glucose recommends itself as a preservative agent, owing to its insusceptibility to variations of temperature; but many people object to anything not contained in the original drug being introduced into the finished preparation. Besides, it would not tend to stiffen, but rather to thin an extract already too liquid. Moss and Umney's plan for the addition of extractive matter is, perhaps, the least objectionable, but it involves increased labour and cost.

We owe our present process for the manufacture of a standardised extract and tincture to the researches of Dunstan and Short, and when first introduced it seemed to leave little to be desired. Experience, however, has shown that there are several drawbacks to the process which, in the opinion of the author, might be obviated. In the first place, the extract is inconveniently

thin and soon increases in strength, owing to loss of water; secondly, no provision is made for the removal of the fatty oil; and thirdly, alcohol is used in such large quantities as to make the cost of production very great. This last particularly applies to the preparation of small quantities of the extract, when, even if the spirit is recovered in the usual way, the loss may vary between 10 and 30 per cent.

The author ventures to suggest the following as offering a method for the economical preparation of nux vomica extract, which, while being firm in consistence and free from oil, shall be little liable to loss by evaporation, owing to the presence of glycerin in the finished product. Briefly, the process is as follows :—

Take of—

Nux vomica in fine powder . .	16 ounces.
Glycerin	½ ounce by weight.
Acetic acid	2 fluid ounces.
Chloroform water	a sufficiency.

Mix the acid with two pints of the chloroform water, and macerate the nux vomica in the mixture in a closed vessel for four days. Transfer to a percolator, and when the fluid ceases to pass, continue the percolation with chloroform water until one gallon has been collected. The percolate is then evaporated at a low temperature—the glycerin being added towards the end of the operation—to 4 ounces by weight, and 10 grains taken, and the alkaloids determined in the usual way. From the data obtained, the extract is brought to the required standard of 15 per cent. of the mixed alkaloids of strychnine and brucine.

If the corresponding dry extract is required, the glycerin must be omitted, and the evaporation continued as far as possible on a water-bath, and the extract finally freed from water in a hot oven or drying chamber, the product being afterwards rapidly powdered and mixed with sufficient inert vegetable powder—such as althæa or liquorice—to bring the final strength up to 15 per cent. The powder must then be stored in small vials, which should be hermetically sealed.

The PRESIDENT having remarked that the question of nux vomica was a perennial one,

Mr. NAYLOR said the tendency appeared to be towards the standardisation of preparations. He did not see any particular

advantage in the method now suggested, though he could not speak positively, not having tried it. He had been accustomed to use a spirituous preparation of the extract, to dry it carefully, and then to make up the preparation with sugar of milk, and he found no difficulty in obtaining it in a condition of powder. He was disposed to think that a spirituous preparation made in the ordinary way would contain more extractive than when dilute acetic acid was used as the solvent. The aim was a galenical preparation, not merely to get out an alkaloid in its crude condition, and he saw no reason for adopting this method unless it possessed very decided advantages. He was distinctly in favour of a powdered extract, because they knew from experience that a fluid extract which might be standardised to-day might not be of the same strength in a week's time.

Mr. Moss concurred in the view that the present extract was much too thin for convenient use, but it would meet requirements if it were standardised to 20 per cent. instead of 15. As to powdering it, it was necessary in order to preserve the degree of standardisation to add some innocent material after drying, and he thought sugar of milk would answer every purpose.

Mr. Lloyd Williams asked if any comparative experiments had been tried, making a spirituous extract and an acetic acid one side by side, and comparing the results.

Mr. Cross asked what was the advantage of using chloroform water over the ordinary distilled water.

Mr. Burnett asked if Mr. Lucas had made any tincture from the extract prepared as he proposed; and was it as soluble in spirit as the ordinary one. He thought the proceedings of the last Conference had vindicated the use of chloroform water.

Mr. Ransom said that various specimens of nux vomica differed very much in alkaloidal value; and whilst one might yield by this method a good extract, others might give one too hard or too soft. His usual plan was to obtain a suitable extract by mixing different samples; some which would yield a 15 per cent. extract were not much too thin, whilst others yielding 20 per cent. were equal or superior. He would also suggest if a powdered extract were desired that some of the sugar of milk, or whatever diluent were used, should be added during the process of drying, because the extract was so very hygroscopic that a good deal of moisture would be absorbed almost before it was powdered; but that would be to some extent avoided by adding the diluent before.

The PRESIDENT said the paper was a very interesting one, and they were much obliged to Mr. Lucas for it. He was quite right in saying that Messrs. Dunstan and Short devised the process for a standardised preparation, over which there was a good deal of cackling, as if pharmacy had solved the problem. Very soon after the Pharmacopœia was published, at the Birmingham meeting he read a paper on the subject, in which he gave an analysis of a number of specimens and the amount of moisture in them, collected from various sources, and showed how unstable this standardised preparation really was. Sometimes you obtained one in the ordinary course of commerce comparatively dry and relatively hard, but he showed then that the amount of moisture varied from 13 to 19 per cent. The ordinary extract, if exposed in a moist shop, rapidly took up moisture, and the standard was altered. Another weak point was that the standardisation depended on the total alkaloid, and the relative proportion of brucine and strychnine was scarcely alike in any two. In making the tincture again from the extract, his experience was that you could never re-dissolve an extract in alcohol and make a tincture which would act as well as one made from the crude drug itself. The old-fashioned method of percolating the nux vomica with spirit to the strength of the tincture was, in his experience, far superior to re-dissolving the extract. Mr. Lucas had made use of a solvent—acetic acid—which he ventured to think would play a very important part in future for alkaloids, and there was no doubt it was the best preservative. He did not think it desirable to introduce glycerin into extracts to be used for making pills. If a chemist dispensed them in that way, he might very likely see them back again if it was in the climate of Cornwall, though they might do very well in the Indian Ocean. With regard to powdered extract, he might remind them that in the last edition of the United States Pharmacopœia there was a series of preparations called "Abstracts," which were made from these standardised extracts by the addition of sugar of milk, but after ten years' experience they had been dropped. He hoped Mr. Lucas would follow up the subject, for he should like to see a perfect process, from the pharmaceutical point of view, devised before the next issue of the Pharmacopœia.

Mr. LUCAS, in reply, said one great advantage of using acetic acid for extracting was that it was so much cheaper than alcohol, of which a great deal was always lost if you had to use a large quantity to exhaust the drug; operating on small quantities from 5 to 20 per cent. was lost, and probably even manufacturers lost a

good deal. Methylated spirit of the old kind might be used in making these extracts, because it was all driven off again; but if you were not operating on a large scale, it was hardly worth while, and the new-fashioned methylated spirit, of course, could not be used. By using water, a great deal more extractive was obtained; with a strong spirit the amount in the case of nux vomica was very small. Again, the water did not extract any of the oil, while by the Pharmacopœia process nearly all the oil was extracted, which made a very disagreeable extract when used for pills. He had operated on three different kinds of nux vomica, and found that one yielded a great deal of extractive matter, and one only a little. Most people who made it on a large scale had a difficulty in getting it solid; 15 per cent. was much too thin. Chloroform water was used in order to make it keep. In hot weather, if you percolated with very dilute acetic acid, it went bad; but a little methylated chloroform preserved it. With regard to the powdered extract, he did not quite believe in it. As the President had said, the Abstracts had been rejected in the United States; but if you required to dry the extract, he thought powdered althæa would be a better diluent than sugar of milk.

Mr. Lucas was thanked for his contribution.

The next paper read was a—

NOTE ON STRYCHNOS IGNATIA.

By F. Ransom, F.C.S.

The seeds of *Strychnos ignatia*, Lindley, have long been known to contain the alkaloids which exist in nux vomica, Pelletier and Caventon, in 1819, having shown that strychnine and brucine were present. The drug has since been examined by various chemists, the result of whose investigations has generally indicated that strychnine is present to a much larger extent than in nux vomica. In 'Pharmacographia' it is stated that strychnine exists to the extent of about 1·5 and brucine to ·5 per cent. This statement appeared to receive confirmation from Harrington in 1886 (*Amer. Journ. Pharm.*, 1886, p. 14), who examined three samples of the seed, finding on an average 1·196 per cent. of strychnine and ·413 of brucine. In each case the strychnine was largely in excess, but as the method employed to separate the alkaloids in

two of the instances consisted in washing the strychnine free from brucine with diluted alcohol, the accuracy of the results may be questioned. In the following year, Coblentz (*Proc. Amer. Pharm. Soc.*, 1886) examined five samples of the U.S.P. abstract, which yielded total alkaloids varying from 3·88 to 4·74 per cent., of which 2·136 to 3·626 was indicated as strychnine by Schweissinger's alkalimetric method.

In order to compare the active constituents of ignatia with those of nux vomica, the following determinations of the seed were conducted by the methods introduced and employed by Dunstan and Short in their investigations of nux vomica and its preparation (*Pharm. Journ.* [3], xiii. 1053). It was found desirable to use 10 grammes of the finely powdered seed, which was firstly percolated in the cold in the inner tube of a Dunstan and Short extraction apparatus, with 80 c.c. of chloroform containing 25 per cent. of absolute alcohol. When the liquid ceased to drop, the tube containing the marc was inserted into the outer tube, to which was fitted an upright condenser. The flask containing the percolate was attached, and by the heat of a water-bath the extraction was continued until the residue from a few drops of the percolate evaporated to dryness and dissolved in dilute hydrochloric acid ceased to give a precipitate with Mayer's reagent. The alkaloid was then extracted from the chloroformic solution by agitation with dilute sulphuric acid (5 per cent.), which was then rendered alkaline with ammonia, and the solution exhausted with chloroform. The chloroform, on evaporation, left the alkaloids in a practically pure and more or less crystalline condition.

An attempt was made to exhaust the powdered seed with ammoniated chloroform, but it was not found practicable to extract the whole of the alkaloid with this menstruum.

Three specimens of the seed were submitted to analysis, with the following results:—

(1) 2·22 per cent. strychnine and brucine.
(2) 1·72 „ „ „
(3) 3·01 „ „ „

The mixed alkaloids found by Dunstan and Short in seven authentic specimens of nux vomica varied from 2·74 to 3·9 per cent., the average being 3·29. As shown above, the percentage in but three specimens of ignatia varied from 1·72 to 3·01, with an average of 2·32. It would therefore appear that in the seeds of

ignatia the variation of total alkaloids is greater, and the average percentage less than in nux vomica.

An analysis was also made of an alcoholic extract of "ignatia" by the official process for the determination of extract of nux vomica. It was found to contain 16·7 per cent. of moisture and 9·6 per cent. of total alkaloids. The lowest found by Dunstan and Short in their analyses of twelve trade samples of unstandardised extract of nux vomica was 10·32 per cent.

Attention was then directed to the separation of the strychnine from the brucine in the alkaloidal residues obtained from "ignatia." The ferrocyanide method of Dunstan and Short (*Year-Book of Pharmacy*, 1883, p. 469) was employed, and the following results were obtained :—

	Weight mixed alkaloids.	Weight of strychnine.	Percentage strychnine.	Percentage of brucine by difference.
	Gram.	Gram.		
(*a*)	·1925	·0885	46	54
(*b*)	·153	·075	49	51
(*c*)	·1905	·1045	54·9	45·1

The alkaloidal residue (*a*) was obtained from the extract. The latter two were derived directly from the seed, and indicate percentages of ·84 and 1·65 strychnine, and ·88 and 1·35 brucine in the crude drug.

The average proportion of strychnine in the alkaloidal residues obtained by Dunstan and Short from the twelve commercial samples of extract of nux vomica was about 43 per cent., the highest being 50·1 and the lowest 35·8.

It appears, therefore, that although "ignatia" may contain a larger proportion of strychnine compared with the brucine than nux vomica, the percentage is more variable, and the average percentage of total alkaloids, so far as may be judged by the examination of three specimens, is considerably less.

The glucoside, loganin, discovered by Dunstan and Short in nux vomica and its preparations (*Pharm. Journ.* [3], xiv. 1025), appears also to be present in ignatia. The extract was boiled with ether and the ethereal solution separated and evaporated to dryness. The residue, when warmed with concentrated sulphuric acid, gave a dark purple coloration characteristic of the glucoside.

The results here recorded would indicate that nux vomica is the better adapted for pharmaceutical preparations, and that "ignatia,"

except for the occasional extraction of strychnine, is not likely to prove of much value for medicinal purposes, while the supply of nux vomica remains abundant.

Mr. UMNEY said he was sorry he could not add anything to the information contained in the paper; but "ignatia" was so scarce a drug that it was rarely met with in commerce, and was very little used, and he thought the superabundance of nux vomica would prevent "ignatia" being used in medicine. It was used on the Continent, but only to a small extent.

Mr. HOLMES said he had had no experience in the extraction of the alkaloid. All he could say was that the seeds varied very much, at least in size, and very likely also in the amount of alkaloid they contained, especially if the smaller seeds came from unripe fruit.

The PRESIDENT said the Conference was much indebted to Mr. Ransom for preparing this paper in addition to his other labours as hon. sec. He had so little experience of "ignatia" himself that he could say nothing about it.

The following paper was then read:—

REMARKS ON GNETUM.

BY W. ELBORNE, B.A. CANTAB.,

Demonstrator on Materia Medica and Pharmacy, University College, London.

Gnetum, L., is a genus of Gymnosperms, giving its name to the natural order Gnetaceæ; the various species are trees or climbing shrubs, natives of the tropical forests of Asia and America, their stems yielding textile fibres more tenacious than hemp, while the leaves and seeds of certain species are said to be edible when boiled. My apology for drawing your attention to this subject is on account of the stems of *Gnetum* possessing internally the remarkable ringed structure characteristic of the natural order Menispermaceæ, and consequently not unlike "Pareira brava"—as a casual glance at the stem of *Gnetum scandens* will show.

The structure of the wood of Menispermaceæ differs from that of other dicotyledons in that the vascular bundles of a young branch (which in most dicotyledons unite and form concentric

rings of wood and liber) generally remain distinct in Menispermaceæ, and are separated by broad radial masses of cellular tissue, corresponding to the medullary rays of ordinary wood. After some time these original wood fascicles cease growing, and in the cortical cellular tissue exterior to the liber originates a second circle of bundles, similar to the first formed, excepting in the absence of spiral vessels. After these bundles have attained full development, they in turn cease to grow, and a third circle forms in the cellular tissue of the bark, and so on.

De Bary * alludes to this anomalous mode of thickening of stems and roots in dicotyledons and gymnosperms as follows:—"As is the case with almost all anatomical peculiarities, the anomalies of secondary thickening also are in part evident phenomena of adaptation, and may in part even be explained directly as the outcome of mechanical causes; they are in part unexplained anatomical characters, which must be regarded as inherited. To the first category belong the anomalies of twining and climbing liane-stems from the most different families, whose non-climbing congeners have normal growth, as in the Bignoniaceæ, Sapindaceæ, Leguminosæ, Malpighiaceæ, and others to be named below. The lianes from certain families, especially the Sapindaceæ, or at least the majority of them, show very special peculiarities. On the other hand a remarkable uniformity is often seen between those belonging to the most different families, as, *e.g.*, Menispermum and Gnetum, Bignonia, and some Apocynaceæ."

Another point of interest in reference to the subject which I do not remember having observed in the text-books is, that while "Abutua" and "Butua" are popular Brazilian terms for Pareira brava (*Chondodendron*, Ruiz et Pavon) and *Abuta*, Aubl., likewise an allied genus (Menispermaceæ), yet the genus *Abutua*, Lour., is synonymous with *Gnetum*, L.

The following description is from Brandis:† —

"*Gnetum scandens*, Roxb., 'Fl. Ind.,' iii. 518, syn. *G. edule*, Blume; vern. Kūmbal, ūmbli, Bombay, is a stout climbing shrub, with opposite coriaceous elliptic-oblong petiolate leaves, 5 to 6 inches long, which turn black on drying; flowers monœcious in cylindric verticillate, paniculate spikes, with numerous short annular sheaths, the flowers mixed with articulate hairs closely packed in their axils. Male flowers monandrous, anthers of two

* "Comparative Anatomy of Phanerogams and Ferns." Oxford: 1884.

† "Forest Flora of North-west and Central India." D. Brandis. London: 1876. Page 502.

distinct cells, opening by a slit at the apex at the end of a thick column, protruding from a thick clavate angular sheath, which splits in two. Female flowers consisting of numerous naked ovules similarly arranged and mixed with articulate hairs. Fruit an oblong one-seeded drupe, 1 to 1½ inches long, narrowed into a thick short stalk, red when ripe. The seeds are eaten. Common in the dense forests of the Western Ghats and the Konkan—East Bengal, Burma, Indian Archipelago, China. The wood of *Gnetum* consists of a large number of distinct wedge-shaped ligneous masses, which are arranged in concentric circles, and separated by cellular tissue. It thus resembles the wood of Menispermaceæ."

Specimens of stems of *Gnetum scandens* and *G. urens*, from the Botanical Museum, Cambridge, were shown at the meeting.

Mr. HOLMES said Mr. Elborne had kindly allowed him to see these specimens, and there was certainly a similarity between menispermaceous stems and *Gnetum*, which was very remarkable, and such as he hardly expected to see. He had never met with any of these stems in commerce, but it was possible they might occur from time to time, and be a cause of difficulty to the pharmacist. Hardly anything was known of the properties of the genus *Gnetum*, but an allied genus, the *Ephedra*, possessed mydriatic properties. It was desirable that the *Gnetum* should be further examined in case it came into commerce in future. He would ask Mr. Elborne if he could point out any special means of distinguishing this stem from pareira.

Mr. MOSS said he many years ago made an examination of pareira root and stem as it came into commerce, and found about three times as much stem as root came to the London drug market, and was regarded as root. He made a microscopical examination of the stem and the root, and a description of them would be found in the *Pharm. Journ.* [3], vi. 702, with diagrams. It seemed to him that the stem now shown was somewhat larger than the usual *Chondodendron* stem, and also that the cortical portion was much more largely developed; it also had a browner tint, though that was not much of a distinction between one stem and another. The fibro-vascular bundles seemed much more largely developed, but he did not know whether that would turn out so on closer examination. He should like to know if Mr. Elborne had made a pharmaceutical examination of the root at all. He had made some

extract of pareira stem with a view of ascertaining whether it was of equal value with the root for medicinal purposes, but did not complete the investigation. He believed he had some of the extract still, and should be pleased to hand them over to any one who cared to pursue the subject.

Mr. REYNOLDS said he could not contribute anything to this subject, which he ventured to say was a novel one to every one present. He would, however, mention, for the benefit of investigators of rare or unknown vegetable products from abroad, that the formation of the Imperial Institute afforded a valuable means of obtaining information with regard to such products. He knew from experience in connection with the Yorkshire College of Science that some of the professors were now engaged on products derived from the Institute, and that Sir F. Abel was always ready to render investigators every assistance in his power.

Mr. BURNETT said it struck him when they were comparing *Gnetum* with the Menispermaceæ that it was not unusual to find menispermaceous stems very similar to the typical structure of the stems of *Pinus*, and he was not surprised to find the general superficial physical characteristics in this case also.

The PRESIDENT said they were very glad to have this contribution to their proceedings from a member of the sister university. He must say that the word *Gnetum* did not convey any idea to him, or he might have brought to the meeting a collection of stems and roots with which the late Mr. Deane used to puzzle some of the students at Bloomsbury Square, amongst which were specimens of *Chondodendron*.

Mr. ELBORNE said he had not made any pharmaceutical examination in this subject, which he simply introduced as an endeavour to explain the botanical source of some of the numerous false pareiras. With regard to distinguishing these from menispermaceous stems, there was a practical test, and that was that on the periphery of each ray of wood would be found numerous fibres; in fact, fibre was obtained by the natives from various stems of *Gnetum*, which was said to be stronger than hemp, and the presence of those fibres would be sufficient to indicate the character. Mr. Moss alluded to the bark being more developed than was usual in false pareira stems; the smaller one, which came from the forests of the Amazon, had the cortex largely developed; but the larger one, which came from the East Indies, had the bark closely adherent; they were both together in the Cambridge Museum. Mr. Burnett drew attention to the fact that certain

stems possessed pitted cells similar to those of the Coniferæ, and he had pointed out in the paper that there were certain plants belonging to the natural order Malphigiaceæ, the wood of which possessed a pitted structure. He did not wish to magnify the subject at all, but he had some dozens of stems possessing a menispermaceous structure, and he had been endeavouring to arrive at the botanical source in a rather unusual way, by observing the absorption spectrum given by the various tinctures, but had not been able to develop the results into a paper for this meeting. He might refer to *Cocculus indicus*, which belonged to the same natural order, and afforded a very poisonous preparation, and was not unlikely to be confounded with some of the false pareira stems.

Mr. ALCOCK remarked that the stem, which he had only seen since Mr. Elborne began his reply, seemed somewhat resinous. Would not that afford a distinguishing characteristic, seeing that the Coniferæ to which *Gnetum* was closely allied were very resinous, whereas the Menispermaceæ would probably not be so resinous?

Mr. ELBORNE said the section of one specimen was resinous, but he should not be inclined to attach much importance to that. He did not think *Gnetum* was a resin-producing plant at all in the same sense as the Coniferæ. It was probably an accidental feature in that particular case.

Mr. Elborne was thanked for his paper.

The two following papers were then read and discussed together.

THE RECOVERY OF RESIDUAL TINCTURES FROM MARCS.

By R. H. PARKER, F.C.S.

The best method for recovering the residual tincture contained in a marc will depend chiefly upon the quantity under operation and the kind of apparatus available. I propose to consider the question as though preparing from 1 to 4 pints of tinctures, etc., with such apparatus as may be found in any pharmacy. Two methods are available for the purpose in view:—Pressure and displacement by water; distillation being applicable to larger operations only.

I. *Pressure.*—This process is simple and expeditious, but the use of the ordinary tincture-press leaves much to be desired. The best results are obtained when the quantity of marc reaches

the maximum capacity of the press. In a recent experiment with 6 pints of tinct. aurant. the tincture when filtered was only 4 ozs. short of the full quantity (the marc on drying lost 5⅛ ozs.). A similar quantity of tinct. gent. co. gave 6 pints of product less 3¾ ozs. (the marc lost on drying 6 ozs.). This shows that the loss can easily be confined to what actually remains in the marc. The loss, however, is much greater (perhaps 30 per cent.) in such preparations as tinct. zingib. fort. and linim. belladonnæ. Even after hydraulic pressure the marc still retains enough spirit to repay recovery by distillation when working on a large scale. Results almost equal to hydraulic power may be obtained with a good screw press if the cup for receiving the marc be comparatively narrow and the marc before pressure nearly fills it. Several sizes of the cups should be fitted to the same press.

II. *Displacement by Water.*—A critical examination of this process does not appear to have been recorded, although many pharmacists have probably made sufficient observations upon its practice for their own guidance in the laboratory.

The use of water for downward displacement of tinctures dates as far back as 1816, when Réal's filter press was introduced.

The results of a systematic application of the method to the preparation of tinctures generally was submitted to the British Pharmaceutical Conference at Brighton (1872) by Stoddart and Tucker, in an elaborate paper detailing the comparative examination of forty-seven tinctures, each prepared by three different processes, viz.:—(1) maceration only, (2) the pharmacopœial combination of maceration and percolation, and (3) percolation with displacement by water. Each of these processes yielded a fair proportion of the best results as regards percentage of extractive, but it was not shown whether displacement by water produced a tincture of diminished alcoholic strength.

The use of water for upward displacement was described by Elborne in 1880 (*Pharm. Journ.* [3], vol. x. p. 973); his results were fairly good, and might be considerably improved by a modification of his apparatus. In this instance also no determination was made of the alcoholic strength of the finished tincture.

III. In order to estimate the value and practicability of displacement by water, I will deal particularly with critical observations on the phenomena involved in the practice of displacement generally, directing attention chiefly to the contact surfaces of the two liquids and their deportment during passage through the marc.

I may say here that the discussion of the principles concerned in percolation and displacement is frequently confined to a consideration of the well-known laws of hydrostatics and hydrodynamics, as though the marc were a limpid fluid; whereas its influence is precisely as though it were a porous solid, and the passage of the liquid through it must be considered in the light of movement through capillary tubes, where hydrostatic and hydrodynamic effects are either largely discounted or altogether overbalanced by cohesive force, adhesive force, and capillarity. The effect of pressure, too, is often wrongly estimated; as a matter of fact, if the internal resistance of the marc be uniform (as it should be), the only effect of pressure is to modify the rapidity of the process; in other words, with a given speed of percolation it matters not what pressure is needed to produce it, the essential condition being that the rate of percolation shall be such that the fluid shall not pass between the particles at a greater speed than it can permeate through their tissues.

Displacement may be aptly contemplated by imagining two superposed fluids passing steadily through a vertical tube, a considerable portion of which is filled with a porous solid; evidently admixture of the fluids will tend to increase with the speed of the process, while diffusion and especially admixture due to currents induced by varying temperatures will be less in the presence of the marc than in its absence.

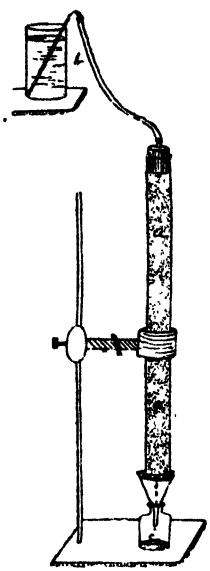
IV. "*Downward*" v. "*Upward*" *displacement by water.*—Two parallel experiments were conducted; in each case 2 ozs. cort. cinchonæ flav. (in No. 40 powder) and 10 ozs. proof spirit were mixed in a 12 oz. bottle and occasionally agitated during three or four days, then poured into a glass tube percolator (2 feet long, 1 inch wide), having muslin tied over the lower end and resting in a funnel and bottle receiver; as soon as the marc filled the tube, and without allowing the liquid to drain away, the upper end was closed with a perforated cork carrying a tube connected with a water supply.

In one experiment the water was forced in at the top, and the displaced tincture collected in fractions at the bottom.

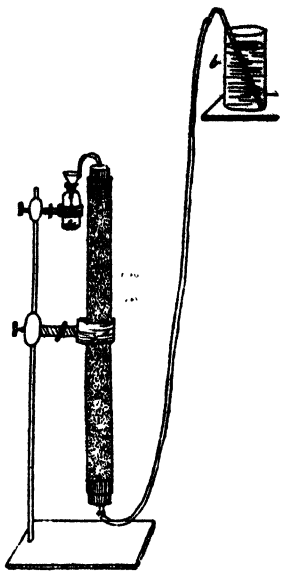
In the other experiment the water was forced in at the bottom, and the displaced tincture collected in fractions at the top.

A comparative examination of the specific gravities of the ractions will necessarily reveal the slightest admixture of water in any portion of the product.

The sketch illustrates the two experiments.



Apparatus arranged for "downward" and "upward" displacement respectively—(*a*) Glass tube filled with marc; (*b*) Pressure water supply; (*c*) Bottle to collect displaced tincture.



The following table indicates the specific gravities of the fractions collected, "0" being the original percolate before displacement commenced.

DOWNWARD. *Tinct. Cinchonæ Flav.* UPWARD.

	Spec. Grav.	Percolate.		Percolate	Spec. Grav.	
Total Tincture 9·2 ozs. Sp. Grav. ·9316. 3·55 per cent. Solid Residue.	·9333	6⅛ ozs.	0	6¼ ozs.	·9323	Total Tincture 9·3 ozs. Sp. Grav. ·9319. 3·60 per cent. Solid Residue.
	·9337	1 "	1	1 "	·9321	
	·9328	1 "	2	1 "	·9323	
	·9327	3 drs.	3	3 drs.	·9320	
	·9326	"	4	"	·9319	
	·9333	"	5	"	·9334	
⅓ colour of "5" tinted pale straw nearly colourless	·9528	"	6	"	·9568	⅓ colour of "5" tinted pale straw nearly colourless.
	·9726	"	7	"	·9773	
	·9800	"	8	"	·9896	
	·9840	"	9	"	·9930	
" " "	·9869	"	10	"	·9931	" " "

The two results are nearly identical. Unaltered tincture continued to percolate in each case as far as the 5th fraction; the 6th fraction appeared strikingly different. Fractions 5, 6, 7, and 8 of each series, showing the overlapping of the fluids, are on the table.

It will be at once observed that the precision of displacement is similar in both cases.

V. "*Displacement by Water*" v. "*Displacement by Alcohol.*"—Strong tincture of ginger was displaced by alcohol, and this in turn by water. 20 ozs. powdered ginger was stirred with 40 ozs. of rectified spirit until completely exhausted, allowed to percolate, then displaced with 40 ozs. of rectified spirit, which was followed by water, and the percolate collected in fractions, the gravities of which are tabulated.

Tinct. Zingib. Fort.

Days.	Percolate.	Sp. Grav.	
1	No. 0, 24¾ ozs.	·8432	
1	1, 8 "	·8427	
2	2, 5 "	·8427	A (Tincture) 40¾ ozs.
2	3, 1½ "	·8435	
2	4, 1½ "	·8436	
2	5, 1½ "	·8427	same colour as 4.
2	6, 1½ "	·8413	lighter than 5.
2	7, 2 "	·8395	half colour of 6.
3	8, 6 "	·8386	¾ colour of 7.
3	9, 7 "	·8347	¾ colour of 8.
4	10, 6 "	·8341	¾ colour of 9.
5	11, 3 "	·8340	
8	12, 3 "	·8343	B (Alcohol) 39¾ ozs.
9	13, 2½ "	·8344	
10	14, 3½ "	·8348	
11	15, 1¼ "	·8345	
11	16, ½ "	·8344	
12	17, 1¼ "	·8346	
13	18, ¾ "	·8364	
13	19, ¾ "	·8398	
16	20, 0 "		

The percolates as far as No. 4 were bulked as "Tincture" (No. 5 might have been included, but over 40 ozs. had already been collected); this gradually shaded off into the alcohol without any sharp line of division. The second series of percolates (B) was entirely alcoholic; the water following it would not pass through the muslin. The entire volume of spirit used was recovered without loss. The juncture surface between tincture and alcohol was not visible in the marc, but a distinct brown line encircling the percolator always evidenced the position and progress of the water through it. Comparing the mixed tincture percolates (A) with the mixed alcohol percolates (B), the former had about five times the colour and about twelve times the pungency of the latter.

Linim. Belladonnæ.

32 ozs. of powdered belladonna root, stirred with 48 ozs. rectified spirit until exhausted, allowed to percolate, then displaced with another 48 ozs. rectified spirit, which in turn was followed by water, and the percolate collected in fractions as before.

It will be seen from this table that a uniform liniment perco-

Days.	Percolate.	Sp. Grav.	
1	No. 0, 13½ ozs.	·8522	
2	1, 20 „	·8522	
2	2, 7 „	·8523	A (Liniment) 46½ ozs.
3	3, 3 „	·8522	
3	4, 3 „	·8522	
3	5, 3 „	·8515	B (Alcohol) 48 ozs.
3	6, 3 „	·8499	
3	7, 3 „	·8486	5 to 8 colour diminishing.
4	8, 3 „	·8474	
5	9, 3 „	·8455	9 half colour of 0.
6	10, 15 „	·8422	10
9	11, 11⅜ „	·8418	to alike, lighter than 9.
9	12, 3 „	·8412	13
10	13, 3 „	·8482	14 double colour of 13, bright.
11	14, ⅝ „	·8495	
12	15, ½ „	·8878	15 cloudy.
13	16, 2 „	1·1032	16 Thick, black syrup containing about 25 % alcohol.

lated as far as fraction No. 4, when it gradually thinned off into the alcohol down to fraction No. 9. No water appeared in the percolate until after No. 15, by which time 95 ozs. had been collected out of 96 ozs. taken at commencement. A black line round the marc always indicated the exact position of the water, and its first appearance in the percolate was readily observed by watching the transparency of the falling drops. The last drop of No. 15 was limpid and spirituous; the first drop of No. 16 was like black treacle.

VI. *Proof Spirit displaced by Water.*—In preparing 4 pints of tinct. cinchonæ co. the saffron was used in its ordinary condition, the orange peel replaced by an equivalent of tinct. aurant.; the bark, serpentary, and cochineal in No. 40 powder; the whole of the menstruum added, and frequently agitated in a stoppered bottle for six days; transferred to a percolator, the tincture re-percolated until bright, then followed by water and the percolate collected in fractions.

Tinct. Cinchonæ Co.

Hours.	Percolate. No.	Ozs.	Sp. Gr.	
	0	68¾	·947	
	1	3	·947	
	2	3	·947	
12	3	3	·947	Tincture, 78¾ ozs., all bright.
	4	3	·947	
	5	3	·947	
	6	1	·978	cloudy, much lighter, some ppt.
	7	3	·991	„ very light, scarcely ppt.
12	8	3	·997	clear, ¼-colour of tinct. aurant., no ppt.

In this case the tincture percolate was uniform until all but 1¼ oz. (out of 80 ozs.) had been collected. The position of the water was scarcely visible in the marc, but its appearance in the percolate was clearly evident on placing the fractions side by side. The change in gravity could easily be detected by pouring a small quantity of one fraction into a previous one, held between the eye and a strong light.

Tinct. Rhei Co.

Four pints of tinct. rhei co. manipulated in a similar manner gave the following results:—

Days.	Percolate. No.	Ozs.	Sp. Gr.	
1	0	61⅝	·9351	
2	1	5	·9358	
4	2	1	·9363	
5	3	1	·9357	
8	4	1	·9364	
9	5	⅜	·9380	
10	6	⅜	·9380	Tincture, 74 ozs.
11	7	⅜	·9376	
12	8	½	·9367	
13	9	½	·9375	
15	10	½	·9376	
17	11	⅜	·9372	
18	12	½	·9373	
23	13	½	·9494	13, clear, limpid.
25	14	1⅛	·9764	14, cloudy, syrupy.

This experiment was unsatisfactory, the displacement being so slow that the watery contents of the percolator required occasional stirring in order to facilitate the process; this perhaps accounts

somewhat for the comparatively large deficiency (6 ozs. on 80 ozs.). The tincture, however, was faultless.

Tinct. Chiratæ.

The ingredients for 32 ozs. of tinct. chiratæ were macerated for four days, then percolated in a cylindrical chimney glass, the lower end of which was tied over with muslin; the fractions of percolate had the following characters:—

Days.	Percolate. No.	Percolate. Ozs.	Sp. Gr.	
1	0	21½	·9219	
2	1	4	·9236	Tincture, 30 ozs.
„	2	1	·9231	
„	3	1	·9232	
„	4	1	·9231	
3	5	1½	·9226	
„	6	1	·9527	slightly opalescent.
„	7	½	·9776	rather darker than tincture, bright, slight sediment.
„	8	½	·9876	
4	9	½	·9936	
„	10	½	·9979	
„	11	½	·9987	
„	12	½	1·0001	same colour as tincture, still very bitter.
5	13	3	1·0060	

The specific gravities of the fractions indicate clearly where to draw the line for tincture, but at a glance they all seemed alike from 0 to 13; however, on close comparative examination, the opalescent appearance of No. 6 raised suspicion, which was confirmed by the darker colour of subsequent fractions, while the specific gravity bottle finally removed all doubt. The continued bitterness in the marc after No. 13 clearly indicates that the B.P. formula by no means exhausts the herb.

Tinct. Opii.

The marc from 4 pints tinct. opii after percolation was displaced by water with the following results:—

Percolate.		Sp. Gr	
No. 0 . . .		·950	
1	2 ozs.	·950	Tincture: bright, all same colour.
2	2 „	·952	
3	2 „	·968	lighter trace deposit.
4	2 „	·988	much lighter; some deposit.
5	2 „	1·006	very much lighter; less deposit.
6	2 „	1·008	„ „ „

VII. *Chloroform displaced by Water.*—Thirty fluid ounces of chloroformum belladonnæ, B.P.C., were prepared, and the fluid displaced by water. The progress of the latter in the marc was clearly visible, and the last percolate of chloroform was tardily followed by a black, syrupy extract, which, of course, had no tendency to mix with the displaced fluid. The apparatus was so arranged that displacement occupied about twenty-four hours. The product was 6½ ozs. less than the original volume of chloroform taken; this loss may partly be accounted for by the high temperature of the laboratory in July (75–80° F.).

VIII. The following deductions may be made from an examination of these results:—

1. That the precision of displacement depends not upon the relative position of the superposed fluids, but upon their relative affinities and miscibility at the surface of contact; an alcoholic solution being much more perfectly displaced by water than by alcohol, especially if each fluid holds in solution a substance insoluble in the other, as in alcoholic percolates of ginger, belladonna, aconite, etc.

2. In the downward displacement of alcoholic tinctures by water, diffusion of the latter into the tincture in advance of the rate of percolation takes place to an inconsiderable extent only.

IX. *Conclusion.*—The preparation of tinctures, liniments, etc., by percolation and displacement with water, is much more economical than by screw pressure of the marc; the process is quite reliable if carefully conducted, but is better adapted to stronger spirituous preparations than to proof spirit compounds. It is, perhaps, needless to point out that the method is unsuitable for operation on a large scale.

The chief points to be observed in order to secure good results are:—

1. The materials should be in fairly uniform powder. No. 20 for porous, readily permeable substances; No. 40 or finer for drugs of denser structure.

2. The ingredients should be freely macerated in the whole of the menstruum (either stirred in the percolator or agitated in a bottle) until extraction is complete.

3. Perhaps the most important point of all, however, is that the marc, during displacement, shall be entirely free from air spaces and air channels. To ensure this, particular attention must be paid to the method of packing the marc, and the precise moment when water should be superposed. The marc should be stirred in

the percolator with sufficient menstruum to form a semi-fluid mixture; when quite uniform and free from air-bubbles it should be allowed to drain, occasionally jarring the side of the percolator against the hand until it acquires solidity; water should be immediately floated on so as not to disturb the marc (this may conveniently be accomplished by pouring the water gently through a funnel into the inverted lid of an ointment pot, previously laid on the surface of the marc).

4. The displacement should not be rapid, and the percolate should be collected in relatively small fractions when the total quantity approaches completion. Cloudiness of the percolate, or its altered gravity and colour, may be taken to indicate the termination of the process.

THE PHARMACOPŒIAL INSTRUCTIONS FOR THE PREPARATION OF TINCTURES.

By R. H. Parker, F.C.S.

In considering the official directions for the preparation of tinctures, the instruction to "add sufficient spirit to make a pint" does not appear calculated to ensure uniformity of product under variety of manipulation: thus—if I make a pint of tinct. aurant., following the B.P. instructions, the final addition of 10 or 12 per cent. of menstruum may be required to adjust the volume of the finished product; operating on 6 pints, I can reduce the final deficiency nearly to 1 per cent.; while if I have to make 10 or more gallons, the difficulty of manipulation may increase the loss to 6 or 7 per cent. If the "making up to quantity" be omitted, the product will be of the same strength if 5 ozs. or 50 gallons be made at a time, and whether the marc be pressed in a lemon squeezer or by hydraulic power.

I would therefore suggest that in the next issue of the Pharmacopœia, all tinctures and similar preparations of about 1 in 8 strength be ordered to be prepared by maceration only, without final adjustment of quantity; those of 1 in 4 or greater strength to be prepared by percolation, so that N fluid parts of percolate represent the activity of one part of drug." The strength of the products would thus be clearly defined, and the pharmacist might be allowed to select his own method of recovering the residue, according to the quantity of material dealt with. The "making

up" is already omitted from the directions for preparing tinctures of nux vomica and cannabis indica.

The formulæ for tinct. zingiberis and tinct. camph. co. might be simplified; the former to be prepared by diluting the stronger tincture, and in the latter replacing opium by an equivalent of its tincture.

I think also that the footnote to the liniments of belladonna and aconite should be omitted, as a needless apology, and an aspersion on the manipulative skill of the pharmacist, there being no difficulty in preparing those liniments of 1 in 1 strength if required.

Mr. UMNEY said if he were now confronted with a paper on this subject, which he read as far back as 1870, he should be obliged to confess that he was not then up to date, and that he had learned a good deal about the manufacture of tinctures since that time. He had been much pleased with this paper, and had learned something from it, as to how far one could go in the displacement of alcohol by water. He remembered Professor Redwood in years gone by telling them that it was not possible to carry out this process under all conditions, and prevent the water mixing with the alcohol. No doubt a pharmacist operating for himself under favourable conditions, with his drugs in a proper state of powder —for percolating hinged upon that—might succeed in making uniform tinctures, but he feared the process of displacing alcohol by water was rather dangerous to the final product, unless in the hands of a very experienced man like Mr. Parker. He had discarded for many years both displacement by water and hydraulic pressure. The former, if carried on by workmen or apprentices, would be sure to lead to mixing. For many years it had been his custom to exhaust every other week 1000 lbs. of cinchona bark, and they could imagine the rate of the mixing of the spirit with water; sometimes the spirit vats only contained 30 or 40 per cent. alcohol, when there should have been 60 or 70 per cent. Of course economy of spirit was an important point to the pharmacist, especially in these days of high duties, but he preferred heat to hydraulic pressure for recovering it. He was in the habit of making tinctures on a large scale, where large quantities of marc were used, and he found the most economical process was to employ slow percolation, and recover the alcohol by heat. He found it was not possible to exhaust 1 lb. of drug without losing

about ¼ lb. of alcohol in the process; for instance, in exhausting 100 lbs. of ginger, he lost 23 to 25 lbs. of spirit, 50 to 60 per cent. over-proof.

Mr. CONROY agreed with Mr. Umney. His practical experience of displacement was certainly adverse to it. No doubt in the hands of a clever expert good results might be shown; but if left in the hands of a workman, his experience was that you got a large admixture of water in the tincture. The process he preferred was hydraulic expression, supplemented by distillation. That was the only process which worked satisfactorily on a large scale. His experience, especially with belladonna, had been very unsatisfactory. The Pharmacopœia process for making an alcoholic extract was to exhaust by alcohol, followed by water, and they all knew that you could hardly get two extracts of belladonna which were alike. On the whole, he did not think this process was practicable, though he felt indebted to Mr. Parker for bringing it forward.

Mr. HARDWICK thought, notwithstanding the condemnation which had been passed on Mr. Parker's method as suited for work on the large scale, there must be something in it, and that it was worthy of attention by retailers. Would there be any difficulty from the swelling of woody tissue on the addition of water, causing a block in the filter?

Mr. MARTINDALE agreed with Mr. Hardwick, especially with regard to lin. belladonna and tincture of ginger; he found an expansion occurred when he attempted to displace the spirit contained in the marc as directed. He carried out the process to some extent by displacing as far as he could, and after getting the quantity of reserved spirit for the next manufacture, watching carefully the specific gravity. The difficulty was that any mixing of the water with the spirit went on so rapidly, and the expansion of the woody fibre in the percolator was such that unless you threw off the top layer you could not sometimes get the process to go on. When it came to displacing proof tinctures, he thought it was better to follow the Pharmacopœia directions, and make up the quantity afterwards, than to adopt Mr. Parker's recommendation. The same with the displacement of proof spirit by water; he thought it was far better to press it out, or where you had the convenience for it, to recover it by distillation; but he found a simple tincture press answered his purpose.

Dr. SYMES said the paper was a very interesting one, but scarcely solved the problem how tinctures could be made

economically on a small scale. Still, they were much indebted to any one who endeavoured to accomplish that, because it was very desirable that the pharmacist should make many, if not all, his own tinctures. One of the difficulties of displacement by water, in addition to the swelling of woody fibre, was that immediately water came in contact with a spirituous solution a certain amount of precipitation occurred—some resinous matter was thrown down, which more or less filled the interstices of the marc, and practically stopped the percolation until a certain amount of it was removed. The only thing he saw for it at present was that if a man made tinctures in small quantities, he must use an extra quantity of menstruum, and if large enough in quantity, recover it by hydraulic pressure, or if he had only a small screw press, be content to lose a certain percentage of the spirituous liquid which remained in the marc, and so long as he got out the whole of the medicinal substance be content, unless he accumulated enough to justify him in distilling it. He presumed Mr. Umney and Mr. Conroy put it in a still and applied steam in some way, whilst keeping the marc well agitated, as this greatly accelerated the recovery of the spirit.

Mr. NAYLOR said he was very much afraid that the tendency amongst pharmacists was too much in the direction of economy, or to see how far 1 lb. or 1 cwt. of a given drug would go in making a particular preparation, and to be sure that the drug was completely exhausted, rather than to secure the quality of the product. He had heard with some degree of surprise that preparations were now being made on a large scale, not in accordance with the directions in the B.P.; whether those products would accord with those made strictly officially he did not pretend to say, but he knew from merely a physical examination of some of them that they were not of the standard required. He would not be surprised to find that such preparations were deficient in aroma, though he did not say they would be deficient therapeutically. Whilst a strong advocate of economical methods, he thought they were bound to loyally follow the methods prescribed in the Pharmacopœia, unless they were perfectly satisfied that the product they obtained in another way tallied precisely with that obtained by the official method.

Mr. CONROY said Mr. Naylor was entirely wrong in assuming that the two manufacturers he had named did not follow the Pharmacopœia process. That process was strictly followed; as much spirit was obtained as could be by that method, and the

tincture was finished, and instead of throwing away the marc, the spirit was recovered.

Mr. PERRY, after thanking Mr. Parker for his paper, said it appeared that he used a cylindrical percolator, and he should like to ask if he found any more difficulty in the use of a conical one. With regard to the recovery of spirit from lin. belladonna, making one gallon quantities he found it was almost impossible to recover the spirit with water. For a long time he had abandoned the use of water for the recovery of spirit from such things, and he was hoping when he saw the subject put down that Mr. Parker was going to provide them with some real method for the entire recovery of spirit. From his experience he could not bear out what had been said.

Mr. GROVES agreed with Mr. Parker that the strength of the product obtained would depend on the strength of the pressure applied. He could not understand how it was that in recovering spirit by means of water a greater quantity was obtained in the case of proof spirit than rectified spirit. One would imagine that the water would sink down and mix with the rectified spirit more easily than with the heavier proof spirit.

The PRESIDENT said he should like to offer a few remarks on this subject before asking them to thank Mr. Parker for his paper. First, because he was the pharmaceutical son of the man who more than any other introduced displacement, viz., the late Henry Deane, and, secondly, because some years ago he had the misfortune to criticise the Pharmacopœia process for making tinctures in terms which disturbed the mind of the editor of the Pharmacopœia. He still, however, adhered to the fact that the Pharmacopœia process was simply disgraceful as a process of displacement. He was surprised that Mr. Parker had not mentioned anything about osmosis. There was no doubt about it that although his theory was that it was a "movement through capillary tubes where the hydrostatic and hydrodynamic effects came into operation," still you were dealing with a dry substance which was formerly in a cellular condition containing matters in solution in the cells of the plant. When you moistened that with a proper proportion of the menstruum, the cells would swell out and produce inside the cell a concentrated preparation. When you introduced the liquid after that you had the process of osmosis going on between the concentrated preparation inside and the liquid preparation outside, and you must give that time; it was a slow process, not quite the simple one indicated by this movement

through capillary tubes. He should be afraid to trust himself, even, to operate with tinctures and use water for displacement, for sooner or later he should probably get into the hands of some active gentleman appointed under the Food and Drugs Act, and be told that his tinctures were not of the strength required. There was a process which obtained in old-fashioned pharmacies, where there was a row of black bottles round the top shelf in which the tinctures were macerated, and when they wanted a pint of tincture the first pint was poured off, and at subsequent intervals the second and the third. Any pharmacist who had anything to do with that process would know that as for securing a tincture which was of uniform strength, the final pint or fraction of a pint would differ very considerably from the first. If he rightly understood Mr. Parker, in making on a small scale, say 5 drachms—though he should not recommend any one to make tinctures on the 5 drachm scale—his method was to put the requisite quantity of drug into a bottle, to add the menstruum to it, and when you wanted a drachm pour it off, and so with the second and third drachm. He did not think that was a process which ought to be recommended or countenanced. Whether you made 4 drachms or 20 gallons, before you used a drop of the tincture it should be a finished preparation. Personally he had a great affection for the shape of percolator introduced by Mr. Deane, which was illustrated in an early number of the *Pharm. Journ.* He had recently constructed some copper ones, and if any one would follow the directions given in early papers no tinctures which could be made would equal them. You got practically 75 per cent. of the soluble matter wholly extracted in the first 50 per cent. of the menstruum, and then when you dealt with the final quantity when dealing with a very weak menstruum, it did not materially affect the tincture whether you got out one pint less from the menstruum if you made the final quantity up to the full amount for which the ingredients were used. Altogether, while these experiments were intensely interesting, and they were deeply indebted to Mr. Parker, he did not think older men with long experience would adopt his suggestions. He hoped there was sufficient literature in existence that if a new Pharmacopœia were going to be published next month a better formula than was in the B.P., or had been put before them to-day, might be adopted.

Mr. PARKER, in reply, said he would like to draw attention to the specimens he had brought with him, indicating a comparison between upward and downward displacement. They were the

fifth, sixth, seventh and eighth percolates of the two systems (referred to in the tinct. cinchonæ flav. table); it would be seen that the fifth was as dark coloured as the original tincture, the sixth was very much lighter, while the seventh and eighth were nearly colourless. The two series were almost identical, proving that upward or downward displacement made no difference in the result, if properly conducted. That proviso was rather important—the "if" came in everywhere. Great stress had been laid on the importance of following the B.P. instructions, but in his opinion it was not so much the blind following of instructions as the intelligent appreciation of the principle of the process and the determination to produce the best result, which should be insisted on. He might say in answer to the President, Mr. Martindale and Mr. Naylor, that "prepared according to the directions of the British Pharmacopœia" (a statement often seen on labels) did not necessarily guarantee the product. "Prepared by a careful pharmacist" would be much more to the point. The "B.P. instructions" might be followed intelligently and carefully, or otherwise, and the product would vary accordingly. A careful pharmacist would always produce a superior preparation, although in some cases not precisely following the *letter* of the "instructions" in its manufacture.

The crucial point of Mr. Naylor's criticism rested primarily on a misunderstanding of both Mr. Umney and Mr. Conroy; he could not imagine how he fell into the error. It was perfectly clear to him that on the manufacturing scale, which those gentlemen referred to, the finished perfect tincture was first made, and the matter of applying heat for distillation was simply for the recovery of waste spirit from the marc.

With reference to "displacement by water," considerable suspicion of the process had been expressed, and the possibility of getting water into the product had been alluded to. Before he experimentally studied its practice, he held those opinions himself, and considered that the idea of placing water upon a marc containing spirit, with the object of forcing the latter downwards, was not only heterodox but absurd. In making such preparations as linim. belladonnæ and tinct. zingib. fort. he had previously adopted a modified form of fractional percolation, viz., after percolating a quart of tincture the marc was washed by another quart of spirit and again by a third quart; the washings being reserved for making the next lot of the same preparation, following as before with a third percolation of fresh

spirit. Speaking of the loss of spirit thus involved to some pharmacists who had tried hydrostatic displacement, he was advised to shelve his theories and put the process to the test of practice. He therefore made an experiment with tinc. zingib. fort., and after percolating the single quantity of spirit, he poured water upon the marc, and was somewhat amazed to find that not a drop of water appeared in the percolate until nearly all the spirit had passed through; that the progress of the water within the marc was always evidenced by a brown line encircling the percolator which gradually crept downwards; and that the first approach of water in the percolate could immediately be detected by watching one or two drops as they fell from the percolator, as long as they were not cloudy they were entirely spirituous. Then he tried the process for lin. belladonnæ and lin. aconiti with similar results. He was satisfied that as regards these *rectified spirit* preparations, a perfect result could be obtained without risk of hydration and with scarcely any loss of spirit. He next examined the process in displacing *proof spirit* preparations; but although he found good results could be ensured, it was not so applicable in these cases because the position of the water within the marc was not self-evident, and its approach in the percolate could not be detected by observing the following drops: in some instances (*e.g.* tinct. chiratæ) the approach of water could only be discovered by carefully noting the specific gravities of the fractions of percolate. There was not the slightest danger of getting water into the percolate if two essential conditions were observed: (1) *there must be no air spaces within the marc*—the contents of the percolator should be stirred in a semi-fluid condition till all air bubbles escaped and the marc (after subsiding) should be covered by water *immediately* after the spirit disappeared from its surface; (2) the percolate should be removed from the receiver at frequent intervals when the line of demarcation approached the lower end of the percolator, ceasing to collect as soon as cloudiness or increased gravity occurred. Non-observance of these two conditions might explain the variability of alcoholic extract of belladonna, etc., referred to by Mr. Conroy.

Rectified spirit was displaced by water more completely than proof spirit, because there seemed to exist between alcohol and water a certain repellent force (easily observed by placing a drop of each, side by side, on a plate) which disappeared when the alcohol was slightly diluted. The same phenomenon might be observed with *strong* sulphuric acid, a drop of which seemed to repel a

drop of water, while a drop of *diluted* acid coalesced with one of water immediately. The expansion of the marc, referred to by Mr. Hardwick, created no difficulty if a slightly conical percolator were used, the tissues could then expand vertically instead of pressing against the sides of the percolator and causing obstruction. As to the best shape of percolator for general use, many large operators preferred the cylindrical; he had, however, found results recorded by one worker which favoured a funnel shape. Evidently the manipulation (particularly in packing) was a more important factor than the shape of the percolator. For hydrostatic displacement, a slightly conical form was best and of such size that the height occupied by the marc was about three times its average diameter. Dr. Symes regretted that he had not solved the problem of making tinctures economically on a small scale. He had shown that 40 ozs. of tinct. zingib. fort. or of linim. belladonnæ might be prepared with about 1 oz. loss only; or 80 ozs. tinct. cinchonæ co. with only $1\frac{3}{4}$ ozs. loss. He did not, however, recommend the process for *proof spirit* preparations indiscriminately; but for *rectified spirit* preparations such as had been experimentally dealt with in his paper, hydrostatic displacement was distinctly successful from an economic standpoint, while with regard to the quality of the products, they could not be excelled or scarcely equalled by the B.P. process, even when followed by a most skilful operator. He would be pleased to hand specimens to Mr. Naylor if he would obtain others from half a dozen different sources and compare them. He had not referred to *osmosis* because its effect would be the same as that of diffusion, viz. admixture of water with tincture. An examination of the specific gravities on the tinct. zingib. fort. table disclosed the fact that although the water was in contact with the tincture over a surface corresponding to a horizontal section of the percolator, during sixteen days, the combined effect of diffusion and osmosis was very small: the percolate was of uniform gravity (consequently free from water) until all but 5 drachms of the spirit had been recovered. With *proof spirit* preparations the effect of diffusion and osmosis was much more considerable. With reference to the "pharmacopœial directions for making tinctures," he maintained that if twenty different operators were directed to prepare widely different quantities of tinct. rhei by the following directions—"put the ingredients with the whole of the menstruum into a stoppered bottle, shake occasionally for several days until extraction is complete, strain,

press the marc, mix the fluids and filter"—the twenty products would be fairly uniform; whereas, if they adopted the B.P. instructions to *finally make up to a given quantity*, these twenty operators would proceed to dilute their products with different proportions of spirit. If the "making up" were omitted, any one might prepare 4 or 5 drachms of a tincture, if need be, by simply agitating the ingredients in a bottle for a sufficient period and filtering; the filtrate would then be of exactly the same strength as if he had made 50 gallons and used a hydraulic press.

The PRESIDENT, while congratulating Mr. Parker on his spirited reply, said he must be allowed to say, though he did not wish to re-open the discussion, that there were several fallacies in his statements.

The author was thanked for his communications.

The Conference then adjourned for the day.

Wednesday, August 1st.

The PRESIDENT took the chair at 10 a.m., and the business commenced with the reading of a paper by Mr. F. C. J. Bird on—

LABORATORY NOTES.

BY F. C. J. BIRD.

Potassium Stearate in Turpentine Liniments.

The compounds of stearic acid with the alkali metals possess in a high degree the property of forming gelatinous solutions with water, the presence of a very small proportion of dissolved stearic soap being sufficient to render a liquid almost solid. It was thought that this might be turned to account in the preparation of a liniment containing turpentine and ammonia as its chief constituents, which, after repeated trials with sapo mollis, had proved unsatisfactory, and had invariably separated. Potassium stearate in solution was at first used, but with little success. When, however, stearic acid was dissolved in the turpentine, and the mixture of ammonia and distilled water added, agitation instantly produced a milk-white emulsion of admirable consistence, and showing no tendency to separate. In this case the large excess of ammonia exerted no disturbing influence, but appeared rather to increase the emulsive power of the stearate. The proportion of stearic acid

necessary for a given quantity of turpentine varies from 1 to 2 per cent., according to the amount of water present, increased water requiring a larger proportion of stearic acid. The acid should be melted on a water-bath, a little turpentine added, the mixture warmed till clear, and then poured into the remainder of the turpentine.

The same process may be applied to the preparation of lin. terebinth., B.P., the formula for which would stand as follows:—

Lin. Terebinthinæ.

Oil of Turpentine	16 fl. oz.
Camphor	1 fl. oz.
Stearic Acid	80 grains.
Solution of Potash	½ fl. oz.
Distilled Water	1½ fl. oz.

Melt the stearic acid with a little of the turpentine on a water-bath, and add to the remainder in which the camphor has been previously dissolved. Mix the solution of potash and distilled water in a bottle of sufficient capacity, add the turpentine solution, and shake vigorously for a few seconds. The result of this formula is a milk-white liniment which is always of uniform consistence and does not separate. The advantage of employing definite materials, as liquor potassæ and stearic acid, in place of the sapo mollis of the present official formula, with its varying percentage of water and free alkali, is obvious, ensuring as it does a liniment which is always of uniform consistence and appearance. The small quantity of stearic soap required to effect the emulsification of the turpentine, and the ease and rapidity with which the liniment can be prepared, are additional points in favour of this formula. One grain of stearic acid requires about 3 minims of liq. potassæ for neutralisation. This corresponds to the formation of the neutral potassium stearate, and is the proportion which succeeds best with ol. terebinthinæ.

It has been shown that with the official process, slight variations in manipulation, even with the same materials, will produce widely differing results; but, working in several different ways with stearic soap, I have not succeeded in altering the character of the liniment.

Distilled Water.

The quality of the distilled water used in pharmacy has from time to time given rise to much discussion, which at all events has had the effect of drawing attention to the very unsatisfactory

condition in which this article is often met with. Distilled water containing ammonia is very prone to develop fungoid growths, and there are many apparently obscure cases of fermentation and decomposition causing much trouble and loss which may be traced to the presence of fermentative bacteria and fungoid germs as impurities in the distilled water. The subject merits more attention than it usually receives, as organic matter of this description is almost more objectionable for many pharmaceutical purposes than inorganic salts.

A still of large capacity was formerly necessary to furnish sufficient distilled water for average requirements, but the small stills on the continuous principle, which have of late years been placed on the market, are far more convenient in use, and need but little attention. Evidently, in a continuous still, the first portion of the distillate cannot be rejected, and the product will always contain ammonia, unless an acid be placed in the still to retain it. To effect this, and at the same time destroy organic matter and nitrites, various substances have been proposed, such as alum and potassium permanganate, sulphuric acid, phosphoric acid, potash and permanganate of potash, and permanganate acidified with sulphuric acid. This last combination is the most effective with a second-rate water, but the distillate always acquires a peculiar odour, which for certain purposes is objectionable. With the view of avoiding this odour, if possible, I tried the substitution of potassium bichromate for the permanganate, and obtained a distillate which was odourless and answered the Pharmacopœia tests. Suitable proportions for use in a continuous still are 10 grains of bichromate and 6 fluid drachms of sulphuric acid for each gallon of the still's capacity. With water from the London mains, sulphuric acid alone, or even oxalic acid, will furnish a very pure water, which, if properly kept, never becomes cloudy or develops fungoid growths.

A microscopical examination of samples of distilled water containing fungoid growths will also show small particles of vegetable tissue, introduced as dust, which have formed nuclei for the growth of bacteria. The appearance of fungi in distilled water is generally attributed to ammonia in solution, but they probably quite as often rise from the fragments of vegetable *débris*, always to be found in the dust of a pharmacy, which form a weak infusion very favourable to their development.

A useful form of vessel for the storage of distilled water consists of a large glass bottle with a stoneware tap and narrow neck, the

latter being plugged with cotton wool and surmounted by a loosely-fitting tin cap. Storage tanks constructed on this principle preserve their contents in a perfectly sweet and clear condition, however warm and unfavourable the situation in which they may be placed.

Syrup. Hypophosph. Co., B.P.C.

It is a well-known fact that syrupus hypophosph. co., when made according to the formula of the B.P.C., will sometimes develop a sulphuretted odour. Various reasons have been assigned for this, such as the use of sugar bleached with sulphurous acid or faced with ultramarine, and the presence of sulphuric acid or sulphates which become reduced by the free hypophosphorous acid in the syrup. Certain it is that all the common sugars (especially beetroot) will develop a disagreeable odour, and it is only safe to employ pure cane sugar which has neither been bleached nor artificially coloured.

A sample of this syrup came under my notice some time ago, which, although prepared with pure sugar and a solution of hypophosphite of iron free from sulphate, still possessed a disagreeable smell. On testing the syrup an excess of sulphates was found to be present, and an examination of the other ingredients revealed the fact that the hypophosphites of calcium, manganese, and potash all contained sulphate as an impurity. I have not yet found a commercial sample of either calcium or manganese hypophosphite entirely free from sulphate; many specimens contain a considerable quantity. Evidently very pure salts must be used, or the alternative, and perhaps more convenient, plan may be adopted of dissolving the hypophosphites of calcium, manganese, and potash in the iron, quinine, and strychnine solution, and before proceeding further with the formula precipitating the sulphate by the careful addition of a strong solution of barium hypophosphite.

Repercolation as a B.P. process.

The process of repercolation, although a favourite one in American practice, and used to a fairly large extent on the manufacturing scale in this country, has not as yet obtained official recognition. This has been doubtless due, not to any want of appreciation of pharmaceutical progress by the compilers of our national Pharmacopœia, but to a laudable disinclination on their part to give authority to any new process until extended trial had proved its superiority over present methods. The time has now arrived, I think, when the question of its adoption should receive

careful consideration, as it may be applied with advantage in two at least of the formulæ of the British Pharmacopœia, viz., ext. cocæ liquid. and podophylli resina.

As a general process it has disadvantages which are not as a rule put forward very prominently by its advocates. The chief of these is the necessity of storing a large number of weak fractions or percolates. This may be of no moment in a manufacturing house where fluid extracts are constantly in progress, but it becomes a matter of consequence to the small pharmacist, who may make such extracts at infrequent intervals, and who does not wish to add an accumulation of unfinished preparations to his already overburdened shelves.

The ordinary official process, carefully conducted, is, in my opinion, preferable for working many drugs on the small scale, but when dealing with considerable quantities, repercolation is superior in economy, and frequently in excellence of product. With respect to the two formulæ mentioned, it presents distinct advantages. The official formula for ext. cocæ liquid. directs the powdered leaves to be percolated with proof spirit until exhausted, the first portion of the percolate reserved, the spirit distilled from the remainder, and the residue evaporated to a soft extract, which is to be dissolved in the reserved portion, sufficient proof spirit being added to make the product up to the required volume. As prepared in this manner the extract, although brownish green when first made, gradually loses its green hue and throws down a heavy deposit. This may be attributed to a partial alteration of the constituents of the leaves by the heat of distillation, and possibly to a little water introduced with the soft extract when dissolved in the reserved percolate. Either alcohol or water, even in small proportion, precipitates ext. cocæ liq., so that if the alcoholic strength be disturbed, deposition may be expected. The change in colour is accompanied by an alteration in the behaviour of the extract when diluted with water, a want of uniformity most undesirable in a pharmaceutical preparation.

When the same extract is made by repercolation no deposit is thrown down, even after many months' keeping, and this alone should prove a strong recommendation in favour of the process. Comparing the two methods, the most noticeable difference is in the specific gravity of the product, which in the B.P. process generally comes out somewhat higher, the average being about 1·010 as against 1·004 by repercolation. But as the former deposits on keeping, this difference is not important.

The details of the process, which I have found to work well in practice, may be of interest. Six percolators are a convenient number to use, although it is quite possible to work with four. The powdered drug is divided into as many equal parts as there are percolators, and supposing 6 lbs. to be the quantity operated on, 1 lb. is uniformly moistened with 16 fluid ounces of proof spirit, and passed through a moderately coarse sieve. The orifice of the percolator having been plugged with cotton-wool, and a layer of clean silver sand placed upon it, the moistened drug is introduced, and a sufficiency of proof spirit poured on to saturate the marc and leave a stratum of liquid above it. The whole having been allowed to macerate during twelve hours, percolation is allowed to proceed slowly. The first 16 fluid ounces of percolate are collected separately and used to moisten the second lb. of coca leaves. This operation is repeated for each percolator, until the first 16 ozs. of percolate attains a specific gravity somewhat higher than that of the finished product. For coca this would be about 1·010, and is generally reached when the extract has passed through about the third or fourth percolator. This percolate is set aside, the second 16 fluid ounces being used to moisten the drug for the next percolator, and the same procedure is followed for the remaining percolators. From the last one sufficient percolate is collected to make with the percolates already reserved 92 fluid ounces in all, and afterwards as many fractions of 16 ozs. each as may be necessary to completely exhaust the drug. An allowance of 4 fluid ounces is made in the product to compensate for the extract in the weak percolates collected for a subsequent operation. When starting with weak percolates in hand, the strongest is used to moisten the contents of the first percolator, and the others poured on in succession; in this case the full quantity of product is obtained.

The process for podophylli resina is another in which the avoidance of heat is undoubtedly advantageous. Much has been written on the deviation of the podophyllum resins of commerce from the B.P. characters and tests, and although this has been shown to be due in many instances to adulteration, and in others to the employment of different processes, it has also been stated that the B.P. requirements are too exacting, and that it is very difficult to obtain a resin answering the B.P. tests by the official method. With this latter statement I entirely agree. An examination of a number of commercial samples certainly gives one the idea that manufacturers experience some difficulty in the matter, for it is

quite the exception to find a sample which is completely soluble in rectified spirit and in ammonia. Many form a clear solution with ammonia, and only partially dissolve in rectified spirit; I have also met with samples labelled "British Pharmacopœia," which dissolved in spirit, but left a flocculent residue when treated with ammonia.

The process of the Pharmacopœia when modified by substituting repercolation for the present method of preparing a tincture and removing the alcohol by distillation, yields a product which is completely soluble in rectified spirit, in solution of ammonia, and in aromatic spirit of ammonia. The podophyllum rhizome should be in No. 80 power, and a fluid extract prepared from it of a strength equalling two parts of the drug in one fluid part of the extract. This, having been rendered perfectly clear by decantation or filtering, should be poured into three times its volume of ice-cold water, the remaining directions being followed as they stand. 100° F. is a suitable temperature at which to dry the resin.

A sample prepared in accordance with the above answered the B.P. requirements in every particular. The colour of the resin was yellowish, with a faint tinge of green; and the yield 3½ ozs. from 5 lbs. of rhizome, equal to about 4·3 per cent.

Mr. JOSEPH INCE said it was very desirable to have a process which would give uniform results in the case of liniments, and if the one recommended would do so it would be a considerable advantage. With regard to the preparation of emulsions and the two liniments mentioned which strictly came under that heading, it was known to every pharmacist that the formula for an emulsion went for comparatively very little in the light of its ultimate success, and that manipulation was equally important with the formula itself. It depended quite as much on tact and delicacy of manipulation as on the formula, and it would, therefore, be a great advantage if any method could be introduced which would avoid that uncertainty, and secure the getting of these preparations in a uniform condition. All these soap liniments depended on the emulsion being prepared by means of soap as a basis, and it literally depended on the operator what turned out. Two experienced manipulators might stand side by side with the same ingredients, and the two would produce emulsions of a totally different character—one would be gelatinous and the other much more fluid. If there were sufficient skill in the operator the present formula would answer very well, but after all it was the dispenser to whom was due the excellence of the preparation.

With regard to the small still in continuous action, he did not think many pharmacists were aware of its great advantages. Many were under the impression that if they wanted anything in appreciable quantity they must have a large apparatus, but there were excellent stills now which worked remarkably well, and comparatively large results might be obtained by the continuous process, particularly in the case of distilled water. In his own small practice, for educational purposes, he had a small still with the continuous process, and by the addition of a little sulphuric acid he produced a distilled water which was all that could be desired.

Mr. JONES said he was particularly interested in the sample of emulsion of turpentine, because he believed this process could be put into a number of hands, and would give a uniform result. He showed some years ago at the Midland Counties Association, that an almost precisely similar emulsion could be made by using oleic acid, and the formula would be found in one of the *Year-Books*. The only difference here was that Mr. Bird used stearic acid, which certainly had the advantage that it could be had in a greater state of purity to start with. At that time he tried various brands of oleic acid, and found practically there was no difference between a very cheap article and that sold as pure oleic acid, so that he was prepared to admit that stearic might have an advantage. He should like to ask whether the emulsion was perfectly inseparable? His emulsion was practically inseparable, but not really so, because after being kept for a month it would show a thin milky layer at the bottom, though a perfect emulsion might be easily formed by shaking. If Mr. Bird's emulsion showed no separation at all in a month, the process might be looked upon as being as near perfection as could be expected.

Mr. LINFORD said he had worked the process published by Mr. Jones, and by carefully testing the amount of potash necessary to saturate the oleic acid before making it, it made a perfectly inseparable liniment, which he had had standing for six months. With regard to repercolation, for the last ten years he had had a series of stoneware cylinders fitted at the bottom with a bung, a glass tube, and a screw clip. He had made a great many preparations, especially with coca, by making a fine powder, stopping the bottom with fine cotton wool and sand, and regulating the flow to about ten drops a minute. Passing the whole through six percolators, one after the other, he found it answer very well. He had a shelf above with holes in, and all that went through the first

percolator was passed into a bottle with a glass tube from it, which just dipped into the fluid in the second one, so that it was going on constantly day and night. Very many substances he had tried in that way he had found to be almost absolutely exhausted, even in the second percolate. He had used the process also for fluid extract of ipecacuanha, and for several concentrated infusions, notably those which depended on the aroma of the drugs, and found it much superior to any other method. This was the result of ten years' experience.

Dr. SYMES said with reference to the syrup of hypophosphites his experience showed that the unpleasant odour developed was almost entirely due to the colouring matter, ultramarine, used by sugar refiners to cover the slight yellow tinge of refined sugar. Sugar should be used in which this colour was avoided altogether; it could be easily tested by making a small quantity of solution and putting it on a filter, when the blue deposit would appear on the surface if it were present. By avoiding that, you avoided the chances of the decomposition he referred to, and were able to see what quality of sugar you had. The more imperfectly refined sugar always had the largest quantity of blue.

Mr. TYRER said he could emphasise the remarks of Dr. Symes. He had had a good deal of experience, and had learnt much from the criticisms of pharmacists. Few had any idea of what the difficulties were in the manufacture of hypophosphites. Anybody who read the text-books, particularly Professor Attfield's, would find a description of the process there which was justified by the formula and the equation, but all he could say was that the equation did not represent what went on. The sulphates appeared from two or three sources. First there was the fact that the phosphorus always contained a little sulphur, and the lime as a commercial article contained always more or less sulphate. The water used was not even the by-product distilled water, for there was not enough of it in the place where a good deal of the hypophosphites were made. The volume of liquid required, including the necessary decomposition and dissolving, re-dissolving and re-crystallizing, involved many thousands of gallons relatively to the two cwt. of material, so that there were possibilities of sulphates here which could not be easily managed. Nevertheless, the fact remained that occasionally syrup of hypophosphites made by even the best manufacturers were complained of on this account, and as it was a serious matter to have such complaints he had made it a matter of very careful investigation. He could confirm what Dr.

Symes had said, that Mr. Bird's solution of the difficulty was the one. With regard to the sulphates and the suggestion Mr. Bird made with regard to barium hypophosphite, it was common-sense itself, but he would draw the attention of gentlemen testing for sulphates to the question of the solubility of barium sulphate in lime solutions. Young chemists especially were under the impression that barium was one of the easiest things to get out of solutions, but let them try to get it out of a solution of hypophosphites. He had never been able in a solution of hypophosphites even moderately dilute to get the exact point at which the barium was just enough to remove the solvent. When you removed the solvent the next complaint was you had a tangible quantity of barium. Some operators objected to the slightest trace of barium as much as to the smallest traces of sulphate. He did not say it was impossible to get them out, but under ordinary manufacturing conditions on a large scale it was a difficulty which skill, science, and experience alone could solve. His advice was—Beware of the sugar!

Mr. UMNEY desired to thank Mr. Bird for bringing forward this matter of the compound syrup of hypophosphites, because it was considered necessary to overhaul the formula which had been published, which was not as perfect as it might be. Mr. Tyrer, as a manufacturer of hypophosphites, spoke with authority, but he had not learnt much from him, and, with reference to what Dr. Symes said, strange to say, he went to Liverpool for his sugar and bought unblued sugar warranted made from cane, and yet he got the odour complained of. Dr. Symes might shake his head, but he had constant complaints that this syrup smelt of sulphuretted hydrogen, or whatever it might be. He had, therefore, no doubt whatever that it was not due to the sugar, and was rather inclined to think that it was more due to some impurity in the hypophosphites. He hoped his colleagues on the Formulary Committee would see if they could not improve on the process. As to the question of repercolation, it was an old fad in pharmacy. Twenty-five years ago he recommended repercolation of cinchona bark; one could start with water, and get to a gravity of 1·050 at the end with repercolation.

Mr. LINFORD said that during the last seven or eight years he had made considerable quantities of syrup of hypophosphites. He always made the solution separately, mixing it with the syrup as required. He had never had any odour from the solution, even when kept a considerable time. He always used

sugar he could warrant free from blue of any sort, generally Martineau's English made.

Mr. CONROY said he could confirm what had fallen from Mr. Umney. Probably the sugar he used was the same, and was absolutely free from blue colour, but he must say, although they made syrup from that sugar which was made specially for the purpose, still they got this odour. He could only attribute it to the hypophosphites themselves. He could confirm what Mr. Bird said, and he did not think it was at all due to the sugar.

Mr. PARKER said this seemed to be a game of shuttlecock and battledore between the ultramarine of the sugar and the impurities in the form of sulphates. The probability was that both of these sources produced sulphuretted hydrogen, but his own opinion was that the great bulk of the danger remained in the sugar. There might be danger from sulphates among the hypophosphites, but if you steered clear of sulphur in the sugar you got rid of a great deal of the difficulty. He had found himself, from experience of sulphuretted syrup, that since he had used the purest sugar he could buy he had never had a sample which had this unpleasant odour, although in preparing a chemical solution he always erred on the side of having a trace of sulphuric acid left rather than any barium.

Mr. GERRARD thanked Mr. Bird for having got rid of many difficulties. Liniment of turpentine had always been a worry to the student, to the examiner, and even to the experienced pharmacist, the difficulty being that the soap was so variable. He had here given something definite, stearic acid and solution of potash, both definite bodies, and by the use of them they were likely to get definite results. He hoped the preparation kept well in the condition of emulsion, though he would not go so far as to say that it should be condemned on account of a slight separation. The present preparations were by no means satisfactory, and if this were found to be what it was represented he had no doubt it would be introduced into the next British Pharmacopœia. The liquid extract of coca had recently given him a certain amount of anxiety. He had a prescription to dispense containing it, and it was noticed that it contained a considerable amount of precipitate. Of course it was sent out with the usual "shake the bottle" label, but shortly afterwards brought back with the whole of the chlorophyll adhering strongly to the sides of the bottle. It was suggested that something was wrong either with the dispensing or the prescribing, but it was soon found out that there was nothing

particularly faulty with either. One could not tell exactly what was going to happen in a new combination, but on repeating the prescription again with a fresh preparation it gave precisely the same result. If they could get rid of this colouring matter from any of the extracts it would be a great advantage; they did not want it there, it was useless and nasty, and gave rise to complaints. Perhaps in this liquid extract of coca there might be some difficulty from the use of heat, and if they could get a watery extract without the employment of heat it would have advantages over one prepared with proof spirit.

Mr. PERRY said there was one drug to which the process of repercolation could be adapted by retail pharmacists, viz., senna. Dr. Clarke called attention to it some years ago, and he had been in the habit of preparing it by repercolation, and got a very admirable product. The leaves were readily exhausted, and he would refer members to Dr. Clarke's paper.

Mr. BIRD, in reply, said he was well acquainted with Mr. Jones's process for making turpentine liniment with oleic acid, which was a very admirable one, but in his experience he found it separate. It might be due to want of adjustment between the quantity of liquid potash and oleic acid. But with stearic acid any quantity between 20 to 30 of liquid potash to 10 of stearic acid would be satisfactory. There were two stearates, an acid and a neutral. As to the syrup of hypophosphites, he was of opinion that both sugar and sulphates were the cause of the sulphuretted hydrogen odour. He might add with reference to the liniment, that it did not separate in the least, being kept for three weeks, which was as long as his experience extended over.

Mr. Bird was thanked for his interesting communication.

The following paper was next read:—

NOTE ON EXTRACT OF MALT WITH COD LIVER OIL.

BY HY. WILLIAMS JONES, F.C.S.

Extract of malt with cod liver oil is popularly supposed to contain as much oil as an ordinary emulsion, that is, half its bulk.

To ascertain how far certain advertised preparations conformed to that standard, I selected four well-known brands, which I judged to have the largest sale.

The method of assay was as follows:—Five grammes was

dissolved in 50 c.c. of water, placed in a stoppered glass separator, and 50 c.c. of ether added. After standing till the ether containing the dissolved oil had separated, the entire upper layer with flocculent matter (a small quantity of emulsified ether and extract) was separated from the clear layer of malt solution. The latter was washed with 25 c.c. of ether, and the combined ethereal solutions allowed to evaporate spontaneously in a glass dish with upright sides. The residue was re-dissolved in ether, to separate the small amount of extract, dried in a water-oven after evaporation, and finally weighed.

The following table gives the percentages obtained. The amount by volume being calculated from the percentages by weight, the specific gravity of the samples, and of average cod liver oil :—

	Percentage by weight.	Percentage by volume.	Consistence.
A	22·76	29·5	Semi-fluid
B	17·82	24·0	Thick
C	14·48	20·1	"
D	1·38	2·0	"

Samples made with 50 per cent. by volume would obviously compete unfavourably with those brands containing less oil, and would have a tendency to show greater rancidity, if not actual separation of oil. As a matter of fact, I know an instance where sample "D" was selected for continued use, as it was regarded as the most palatable preparation which could be procured.

Mr. ALCOCK asked if Mr. Jones could give the origin of these things more definitely. It was highly probable that the sample was a small quantity of oil, come from what they knew as "stores," and if that were the fact, it would be well that the world should know how pharmacists had to compete against the most dishonest practices. With regard to the process, he would ask if he succeeded in separating the flocculent portion from the ethereal layer? He found in the analyses of these emulsions that the Berner Schmidt method adapted for the examination of milks for fat was very useful for emulsions. It was very difficult sometimes to get the whole of the oil from the flocculent layer.

Mr. UMNEY said he hoped, when he saw this matter was coming before the Conference, that they would have a little light thrown on the subject; but, unfortunately, Mr. Jones seemed to have

dropped the matter when he ought to have gone on. He showed the great variation in trade samples, which was to be expected, inasmuch as there was no authorised formula for their preparation, but that was all. It was quite clear that this matter should be taken up by the Formulary Committee, and that they should decide whether a 10, 20, 30, 40, or 50 per cent. mixture of these substances was desirable. If Mr. Jones had made experiments in that direction, and said that in his opinion a 10 or 20 per cent. mixture was desirable, they would have had some real information. He had seen considerable quantities of this extract prepared. It could be made by two methods: first, by mixing oil with the extract by mechanical means, and secondly, by using some such body as pure gum arabic, and there again he hoped Mr. Jones would have given them the benefit of some experiment as to which method was the most desirable for preparing this body, which was not an emulsion, strictly speaking. The public liked it, and evidently believed they obtained benefit from the mixture of these two substances, one being a good feeding substance, and the other a valuable medicine, and therefore the sooner the Formulary Committee decided what the strength of the mixture should be, and how it should be made, the better. He must say he was horrified to find there should be such a dilution as 1·2 per cent. in one case, and in another 25 to 30 per cent. His own idea was that the bulk of this extract contained between 10 and 20 per cent. of cod liver oil.

Mr. CONROY agreed that the Formulary Committee should take up this matter. His impression had been that cod liver oil and malt contained 20 to 25 per cent. of oil. Many years ago it was made containing as much as 50 per cent., but that was never obtained now, as far as he knew. As generally sent out by the wholesale trade it contained 25 per cent.

The PRESIDENT said he agreed with what had been said, that Mr. Jones had stopped short at the most interesting point, and he hoped he would continue his researches. It was important to know, with all advertised preparations which were sold pretending to be something or other, what their constitution was. Even when analyses were published in the medical journals, and copies were affixed to the vessel or pot, stating they contained this or that, they were often delusive. It had been his experience that a preparation bearing a label stating that it contained 15 per cent. of moisture, on analysis proved to contain 30 per cent., so that it was not at all peculiar to malt and cod liver oil. The same

principle ran through the whole gamut of advertised nostrums, and as medical men seemed to prescribe these nostrums for their patients, they certainly did want formulæ on a scientific basis, and he had no doubt the Formulary Committee would take notice of it.

Mr. JONES, in reply, said he had made some experiments, but was not yet in a position to say how one could mix 50 per cent. of oil and get a preparation which would keep for six or nine months, because some people would keep it for a long time. With regard to the proportions, he should prefer, if possible, 50 per cent. On the Blue List there was formerly the question with reference to malt extract itself: Why did it go solid? but he supposed everybody knew now, as it did not appear on the list. The method recommended by Mr. Alcock was very good for separating fat, but he found the best way was to divide it into two parts, first to allow the ethereal layer to separate completely, which in some cases took two days, and run off the lower layer through the stopcock. Then run off the entire ether and the entire flocculent layer, evaporate the whole down, and redissolve. By that method there was no chance of leaving anything behind, or getting anything out that was not there. With regard to mixing by mechanical means, he remembered reading in one of the journals an answer to a correspondent. "You cannot expect to make a very fine cod liver oil and malt preparation; you cannot compete with what you buy, because the manufacturers spend thousands of pounds on having the most perfect mechanical mixers." He did not think that was required at all, and knew you could make it with any common pestle and mortar if you had the malt extract of the right consistency and ordinary oil. You could make a 50 per cent. emulsion, but it would not keep, and he did not believe an expensive apparatus would make it keep any better.

The next paper was on -

THE KEEPING QUALITIES OF CERTAIN SAMPLES OF SPIRIT OF NITROUS ETHER.

BY HY. WILLIAMS JONES, F.C.S.

The rapid deterioration of spirit of nitrous ether under ordinary conditions of every-day use is well known, and has been commented upon by a number of observers.

To test the keeping qualities, under specially good conditions, I

set aside a number of samples in January and February last year (1893). The stoppers of the bottles were luted down, tied over with leather, and placed in a cool cellar, where they remained undisturbed until they were finally examined.

The loss of ethyl nitrite was considerably less than anticipated, and is shown in a tabular form. Column I. gives the number of c.c. of nitric oxide yielded by 5 c.c. of the spirit when received, and column II. the yield of gas after keeping for the time specified.

Since testing my samples I find that similar, though not quite identical, results have been recorded in the last (1894) edition of Squire's "Companion to the British Pharmacopœia."

The editors of that volume say: "Dymond (*Ph. J.*, xix. 467) states that nitrite of ethyl in rectified spirit decomposes from there being so much water in it, and that this is likely to account for loss of strength on keeping. Our experience scarcely agrees with this. When evaporation is prevented we do not find the loss to exceed 6 per cent. (32 c.c. of gas from 5 c.c. reduced to 30 c.c.) in a month, and believe evaporation to be the chief cause of deterioration."

Now, however true it may be that the loss of ethyl nitrite is mainly due to evaporation, a distinct loss, in all probability due to the water present, is observable in all cases; and a very notable change is apparent in the only sample (No. 9) amongst those procured, which exceeded the limit of specific gravity given by the British Pharmacopœia.

TABLE OF RESULTS.

	Sp Gr.	I.	II.	Time of Keeping	
1	·8460	41·0	39·5	15 months	Solution of ethyl nitrite
2	·8398	41·0	34·0	15 „	Made from "B.P." quantities of materials
3	·8414	39·0	37·0	14 „	Trade sample
4	·8392	39·0	33·5	14 „	„ „
5	·8379	38·0	33·5	15 „	Made from purchased liquor, 1·7
6	·8449	37·5	31·5	14 „	Trade sample
7	·8430	37·0	31·5	14 „	„ „
8	·8437	36·0	28·0	15 „	„ „
9*	·8477	36·0	14·5	15 „	„ „
10	·8384	33·0	31·5	14 „	„ „

* The only sample met with below "B.P." sp. gr.

Mr. GROVES said if Mr. Jones could give them some idea how to keep nitrous ether without deteriorating, they would thank him very much. They all knew this spirit was liable to deterioration, partly owing to evaporation, and partly to temperature. He presumed the bottle was practically full, so that the contact with air was prevented.

Mr. SIMPSON said his experience was that if this substance were kept in stoneware bottles at a low temperature, or in coloured or black bottles, it was less liable to change than in ordinary white bottles.

Mr. SPILSBY said he had kept some samples for a considerable time, except that instead of being the spirit of nitrous ether of the British Pharmacopœia, it was an ethyl nitrite prepared by a process modified somewhat from Duncan's. Samples were prepared in February, 1893, and the results of testing, though not very systematically, were very satisfactory. He tested it in November or December, after it had been frequently opened, and the bottle was only half filled, and it then gave 30 volumes of gas from 5 c.c. The samples were stored in a similar condition to Mr. Jones's, in a light cellar with no direct sunlight. Additional precaution might be taken by those storing the spirit by smearing the stopper with a mixture of hard and soft paraffin of about 3 to 1, which greatly prevented the diffusion of gas through the stopper.

Mr. UMNEY said the father of the Pharmacopœia process was the late Professor Redwood, and most of them at Bloomsbury Square had heard him harangue over and over again on the merits of spirit of nitre. He always contended that it was not ethyl nitrite alone which was the medicinal agent in spirits of nitre, but that aldehyde and other bodies were equal medicinal factors. Unfortunately, Professor Redwood was gone from them, and since his death they had had the researches of a very eminent therapeutist, Professor Leech, who had shown, without any doubt, that the medicinal property was due to ethyl nitrite. Now came the question how long were they going to continue the old-fashioned pharmacy of the 1746 Pharmacopœia, and whether they should not in the next one put a definite solution of ethyl nitrite which could be made of a definite strength. He could not say the preparation would keep, because it was as natural for ethyl nitrite to decompose as it was for iron to rust. The Pharmacopœia recognised that, as it gave a maximum and minimum strength. It was hopeless to expect to get a spirit of nitre which should be definite in composition at all times. If they could not discard the old

preparation, at any rate they might have a new one side by side with it.

Mr. LINFORD said he made spirit of nitre some time ago by the ethyl nitrite process, but constantly had it returned, as it was not the spirit of nitre people were used to.

Mr. WRIGHT said there was a very good reason for the complaints Mr. Linford said his firm had had from time to time. He was quite sure that if any pharmacist who had been in the habit of selling the old-fashioned sweet spirit of nitre laid in a stock of spirit made according to the Pharmacopœia, he would soon have some of it returned on his hands with similar complaints. They were all aware of the fact that sweet spirit of nitre was employed very largely for domestic purposes, and amongst other things for producing a diaphoretic effect, and, according to his experience, when the spirit made from ethyl nitrite according to the 1867 and 1885 Pharmacopœias had been sent out, they had been met with the complaint that it failed to produce that distinct effect which was certainly obtained by sweet spirit of nitre made according to the old process.

The PRESIDENT said no one would dream of minimising the work of Professor Leech, but that work was done from a chemical, physiological, and pathological point of view. But the practice of clinical research should not be lost sight of, and they should not be guided too much by theory in these things. Science was liable to get rid altogether of the result of experience. As a diaphoretic, no doubt the old-fashioned spirit of nitre was a different thing to ethyl nitrite, which affected the arterial pressure.

Mr. WARD said they were indebted to Mr. Jones for bringing this subject forward. It ought to be settled for the peace and comfort of pharmacists as well as for the satisfaction of the manufacturer. He had made a note as to the variability of ethyl nitrite. From a sample made on October 27, 1890, 1 c.c. gave 25 c.c. of gas. It was then put on one side, and was not opened until December, 1893. The bottle was about three parts full, but there was no reason to suppose that a large amount of air had had access to it. When examined this 1 c.c. gave 7 c.c. of gas instead of 25 in 1890. He had examined it again this month, and found that 1 c.c. gave 4·5 c.c. of gas. It was made from as concentrated a solution of ethyl nitrite as was possible to obtain without having recourse to very special means, and was a fair indication of the liability to change which marked this body. It had been pretty well decided that the presence of moisture was to

a very great extent the accelerating agent, and that if you had a sample of sweet spirit of nitre nearly free from moisture the liability to change was reduced. If pharmacists who did not make their own would insist on purchasing B.P. spirit of nitre instead of the ·850, which was somewhat extensively purchased, they would insure a much greater permanence in the product. There did not appear to be much difference in the method between one and the other, but the greater amount of moisture present greatly accelerated decomposition. His attention had been drawn to the case of a chemist who was prosecuted for the sale of sweet spirit of nitre, which had a specific gravity of ·850, of which 5 c.c. gave 2·6 c.c. of gas. It appeared to him that the analyst or inspector did not act very wisely, but he managed to secure condemnation of the article, much to the distress of the chemist who had bought it, and very unwisely supplied it after keeping it for three years, not being aware apparently that it was so liable to change. Anything which would bring them to a better understanding of the product, and relieve them from harassing interference by food and drug inspectors, would be a boon.

Mr. PERRY said six or seven years ago he made some experiments on the keeping properties of sweet spirit of nitre under the ordinary conditions of the shop, which were published in the *Pharmaceutical Journal*.

Mr. JONES, in reply, said the original motive for setting aside this sample was to find how long one could keep the ordinary B.P. spirit if the best conditions were adopted. He was frequently asked how long it would keep, and what was the best way of keeping it, and his answer always was, first buy the B.P. sample, and then put it in the cellar; then have a nitrometer upstairs and test it continually, and, if necessary, bring up some of the stronger article from the cellar to bring it up to the proper strength. His samples were kept in the original bottle, in an ordinary cellar not absolutely dark.

Mr. Jones was thanked for his two practical papers.

The next paper, the substance of which was given extemporary, consisted of—

NOTES ON THE GEOLOGY, BOTANY, AND RIVER SYSTEMS OF OXFORD AND NEIGHBOURHOOD.

By G. C. Druce, M.A.

I have been asked to say a few words on the physiography of the country round our ancient and classic city. I must ask those who know our district to pardon me touching on what to them may be a threadworn theme; and to those to whom it may be new and strange, I must offer my regrets that this most interesting subject has not fell into better hands to deal with. To all present an apology is needed for this innovation in our proceedings.

Situated as we are, nearly in the centre of England, in the midst of fairly well cultivated and fertile country, we can boast no romantic scenery such as may be seen in the precipitous cliffs, mountain gorges, or picturesque waterfalls of Northern Britain or Wales. But although placed amid tamer scenery, our district offers to the visitor much to interest and charm. We can boast no great elevation of surface, but our highest point, Walbarrow Camp, south of Hungerford, is nearly 1,000 feet high, and the eminences in the northern part of Oxfordshire, such as Edgehill and Tadmarton Camp, are about 800 feet. As late as the end of the seventeenth or beginning of the eighteenth century other ideas prevailed, for the then curator of Ashmole's Museum wrote to inquire of a fellow antiquarian which was the highest hill in Britain. Some, he says, "say Penygent, and others the Peak; but for his part he believes Stokeenchurch Hill, in Oxfordshire, to be the highest in Britain." It was over this hill that the coach road from Oxford to London was made, and its greatest elevation does not attain 800 feet. Visitors, therefore, from our mountainous parts of Britain must forgive my use of the word elevation, or rather interpret it relatively to our more equalised surface, the factor in this lessened variability being the geological character of the rocks of which it is composed. The older primitive rocks of igneous origin, the Silurian or Cambrian, do not enter our boundaries. We belong to more recent times, and our rocks—I use the term rather in the geologic than the ordinary sense—are stratified. The oldest formations are found in the northern part of the area, and are represented by the lias group.

From Banbury, travelling southwards through the district from

Oxford to Reading and Windsor, the visitor would pass over a succession of formations arranged in more or less regular bands, which cross the country almost west and east. These belong to successive periods of geologic history. With a trifling exception, all the various strata in our area would thus be crossed in a railway journey of an hour and a half. It is this successive change in the strata which causes the pleasant and varied character of the country which is passed through. But from the soft character of the formations, the variations are gentle, and the outlines of the scenery are marked by no abrupt changes or sharply defined forms. Instead, we get gently undulating country, broad alluvial meadows, low and rather obscure escarpments, low tracts of arable land, gently, softly swelling hills of chalk, and gravelly heathland as we pass along.

If, however, the visitor enters our boundary by the London and North-Western Railway from Bletchley, he will not cross, but, instead, will follow along one of these bands of strata from east to west, and this formation is the London clay, which forms a low, flat, uninteresting tract of country. If our visitor comes from the west, and enters Berkshire from Swindon, so, too, he will follow another band, in this case composed of gault, which, like the Oxford clay, forms low, flat, uninteresting country between Swindon and Didcot.

With your permission, therefore, I will shortly enumerate the various geologic formations found in our borders.

The oldest, as I have said, is the Lower lias clay, found in North Oxford, which exists as a blue, clayey material. Near Banbury it shows itself as a hard, shelly limestone, full of innumerable fossils, sufficiently dense to allow of its being worked into chimney pieces, which take a fair polish. It is locally called Banbury marble.

Next to this comes the marlstone, which forms an elevated plateau. This formation was once covered with the upper lias, but this has been denuded from the more elevated portions of its area. The top of the plateau is formed of a stratum called the rock band; it is a sandy limestone with a considerable percentage of iron oxides. Near Banbury it has been extensively quarried for iron ore. In 1874 40,000 tons were excavated. Near Fawler, on the confines of Wychwood Forest, the same formation is also quarried for ironstone. One of our most local plants is found upon it, *Thlaspi perfoliatum*, whose distribution is confined to three counties.

The upper lias consists of blueish clay and shales, which have

been so denuded as now to consist only of narrow strips and outliers. A well-known pharmacist, Mr. Beesley, of Banbury, whose work in natural history has been so valuable, has made a very complete list of its fossils.

Lower oolites are represented by some sandy beds, which are found upon the upper lias beds in North Oxfordshire. Epwell Hill, 743 feet high, is capped by them, as are also Wigginton, Crouch Hill, and Tadmarton.

The Northampton sand really includes two formations, one belonging to the inferior, the other, which is the upper portion, to the Great oolite. Eastwards in Lincolnshire, these formations are separated by a thick bed of limestone, which has thinned out westwards, so that in Oxford the two formations have met, and are almost indistinguishable.

Great Oolite.—To the south of the district covered by the Northampton sands the beds known as the Stonesfield slates occur in the form of a laminated limestone. This contains an immense number of fossils, not only of animals, but plants and insects. A very extensive series is preserved in the University Museum here. This stone splits readily along the bedding planes into slabs thin enough to be used for roofing purposes. The roof of Wadham College may be cited as an example.

The Tainton quarries have produced the most durable stone in the country; Burford Church, Blenheim Palace, the inside of St. Paul's Cathedral, and many old buildings in Oxford have been built out of stone belonging to the Great oolite.

The upper part of this formation consists of a group of limestone marls and clays. It forms a tabulated surface, intersected by narrow channel-like valleys. In fact, it forms a repetition of the marlstone plateau, and, like that, is dotted over with outliers, which, in this case, consist of Forest marble, capped by Cornbrash and Oxford clay. East of the Cherwell it is covered with a thick deposit of drift, which gives an undulating surface to the country near Brackley. The escarpment of the Great oolite is much broken by faults. The interesting plants found on this formation are the very local *Stachys germanica*, *Salvia pratensis*, *Thlaspi perfoliatum*, *Astragalus danicus*, *Cephalanthera pallens*, *Cynoglossum montanum*, *Monotropa*, the latter plant occurring on two small outliers, one at Islip, the other at Middleton. Plants which are especially abundant on this formation are *Clematis vitalba*, *Carduus crispus*, *Brachypodium pinnatum*, and *Bromus erectus*.

The Forest marble is a sub-formation of the Great oolite, and

is so called from its occurrence in Wychwood Forest. It consists of hard, flaggy limestones, much ripple-marked, and often formed of oyster shells cemented together by carbonate of lime. It is of very irregular occurrence. Next to this in age is the cornbrash, which is the upper formation of the Lower oolite, and consists of a group of limestones, very regular in its bedding, and which stretches across Oxfordshire in a rather regular band of not very interesting country. It is well adapted to the growth of wheat. A curious row of inliers of the cornbrash are brought up along an anticlinal line stretching far eastwards. They occur as dome-shaped masses, rising out of the flat, dull plain of the Oxford clay, and on these inliers many villages have been built.

None of the foregoing formations extend into Berkshire.

The Middle oolites consist of the Oxford clay, the lower calcareous grit, and coral rag. The former I have alluded to; it consists of a thick blue clay, weathering on the surface to yellow. It covers a broad tract of country from Lechlade, by Bampton, Ducklington, Hampton Poyle, the dreary flat of Otmoor eastwards, to the Bucks border. It is to this formation, and the proximity of the river, that Oxford owes its humid and relaxing air. The Oxford clay is 600 feet thick near this city. In the west a thick deposit of drift occurs, the Wychwood outliers being capped with a quartzose gravel at an elevation of 500 feet. On these places several ericetal and uliginal plants occur of interest, such as *Erythræa pulchella*, *Sagina nodosa*, *Scirpus fluitans*, *Peplis*, *Comarum palustre*, *Mentha piperita*, *M. sylvestris*, *Stellaria palustris*, and *Rumex maritimus*. One very rare and exceptionally interesting plant found on the Oxford clay is *Sonchus palustris*. Roses are very variable on the clay, while Rubi are but poorly represented. The lower calcareous grit and coral rag form an elevated plateau overlooking the Oxford clay, which extends from Faringdon, by Cumnor, immortalized by Scott, to Beckley and Stanton. Although this plateau is of no great height, yet very extensive and beautiful views may be obtained from the top of the northern escarpment. *Arabis perfoliata*, *Vicia lathyroides*, *Sedum dasyphyllum*, *Carum segetum*, *Calamintha nepeta*, *C. menthæfolia*, *Geranium rotundifolium*, *G. pyrenaicum*, *Sisymbrium sophia*, *Carduus tenuiflorus*, *Impatiens parviflora*, *Arenaria tenuifolia*, and many other plants occur. The small valleys, formed by streams which flow from its escarpments, afford the most interesting bog land in the district. The list of plants is too extensive to give in anything like detail, but I may say that *Scirpus sylvati-*

cus, *Potamogeton plantagineus*, three species of *Utricularia*, *Parnassia*, *Pinguicula*, *Drosera*, and a rich series of sedges are to be found.

The Headington quarries in this formation have yielded much of the stone of which Oxford has been built. The ruined condition of many of the walls is owing to the use of this stone, which weathers very badly, especially if it be put in so that the bedding planes are exposed. The bridge at Henley is also built of this stone. It is largely composed of shells and corals.

We now arrive at the Upper oolite, represented by the Kimmeridge clay, and the Portland sand and Portland stone.

The Kimmeridge clay is a very stiff, dark-blue or olive green clay, sometimes sandy, and occasionally with bands of fossiliferous limestone. It stretches in an irregular band across the country, often forming flat pasture land, but on the eastern side is obscured with a thick deposit of drift. Large crystals of selenite are found in it on Shotover Hill. In Berkshire, at the juncture of it with the coralline oolite, one of the springs which it throws out is sufficiently saline to give rise to a partly marine flora. *Scirpus maritimus*, *Apium graveolens*, *Carex distans*, *Spergularia marina*, *Xanninchellia pedicellata*, *Vaucheria dichotoma*, var. *submarina*, etc., occur.

The Portland sands preserve the calcareous grit. They are found on the Shotover range. The Portland stone is a white limestone which, like the Portland sand, is only very sparingly represented in the area. The higher portion of Shotover Hill is formed of these beds. On the ordnance map, the iron sands on the top of Shotover Hill are coloured, as if they belonged to the lower greensand, but they have also been placed in the Purbeck beds; now they are believed to belong to the Wealden series, a fresh-water formation. These sands contain a very thin bed of excellent ochre. The vegetation on them is also very interesting, but enclosures have done much to rob it of their characteristic flora.

The cretaceous formation next claims attention. The lower greensand makes a light arable soil. At Faringdon it forms the well-known sponge gravels. For a considerable distance in the Vale of Berks, this band of lower greensand is overlapped by the gault. The hills of Foxcombe, Boars Hill, the pleasant wooded district of Nuneham (which we shall see on our excursion), are of this formation.

The gault, which is a pale-blue clay, extends in an unbroken band across the area; the ground is flat, and often marshy.

Rumex maritimus, *Fritillaria*, *Bidens cernua*, etc., are found on it.

The upper greensand extends parallel with the gault in a belt of valuable arable land from Wiltshire to Buckinghamshire.

Next to this comes the chalk, which forms an elevated area of south Oxfordshire and central Berkshire. The bold northern escarpment stretches from the Aylesbury hills across to Swindon, its highest point being touched on the White Horse Hill, nearly 900 feet high; and the top of the escarpment is marked by a long line of British encampments, and the ancient road called the Ridgeway. The views from the heights must be seen to be appreciated. The chalk consists of the lower and upper chalk, which may be distinguished by the occurrence in the upper chalk of flints, which are usually placed in the bedding planes. The cutting at Pangbourne shows this very well indeed. The flora of this district is peculiarly interesting—*Orchis simia*, *O. militaris*, *Ophrys apifera*, *O. muscifera*, *Neottia*, *Linaria repens*, *Iberis*, *Helleborus viridis*, *Daphne mezereum*, *D. laureola*, *Galium sylvestre*, *Atropa*. Near Newbury and Hungerford the chalk dips under the river Kennet, which really flows through a synclinal trough of chalk. It reappears on the southern side in a bold escarpment which attains the highest point of the chalk in southern England, namely, 975 feet. Near Kintbury some 2,000 or 3,000 tons of whitening are made annually. It is prepared from the upper chalk by a rough process of grinding and elutriation. The chalk country of Oxford forms a portion of the Chiltern Hundreds. In the south part of Oxfordshire and the central part of Berks, the chalk becomes more or less covered with tertiary deposits. Between these and the deposit of the chalk formation, which, you know, is to a great extent composed of Foraminifera (which our revered member, H. B. Brady, studied so closely), an immense interval of time elapsed, the intervening beds either having been denuded off, or the chalk must have been raised above water level. These tertiary beds belong to the Eocene formation, and consist of the Reading beds and London clay. It is to the occurrence of these two formations that the heathy character of so large a portion of the south is due. The Reading beds consist of alternations of clay and sand. The London clay sometimes contains septaria. Near Wargrave it reaches an elevation of about 500 feet. On these formations such plants as *Centunculus*, *Radiola*, *Erica tetralix*, *E. cinerea*, and *Vaccinium* are found. To the Eocene series may be also placed the Bagshot beds, which cover a large surface of southern Berkshire, but which do not

extend into Oxford. These Bagshot beds consist of sand, gravel, with occasional seams of pipe-clay. The surface of the country on them is completely changed, heath-land, pine plantations, and hilly country, with deep alder gullies, and bogs covered with sundew, cotton grass, and bog myrtle are to be found. Specially interesting plants of this area are *Illecebrum*, *Hypochæris glabra*, *Arnoseris*, *Teesdalia*, *Osmunda*, *Viola lactea*, *Phegopteris polypodioides*.

A large area of southern Berkshire, near Maidenhead, is covered with low, level gravels. On these *Dianthus armeria*, *Arabis perfoliata*, *Lactuca virosa*, etc., are found. When I have mentioned that our rivers are often bordered by broad alluvial meadows, which here and there are covered with *Fritillaria* or fringed with Snowflakes, and underneath which rest the bones of primeval man, or, at any rate, the rude instruments he used, mingled with the bones of the animals he hunted, such as *Bos primogenius*, the wolf, and the beaver, I think that the salient features of the geology of the country have been touched upon.

A few minutes may be given to the rivers, or rather river, which drains our area. Oxford, as you know, is seated on a tongue of land between two rivers, the Thames and Cherwell, and the area I am treating is almost exclusively in the Thames basin. A small portion only in the north-east drains into the Ouse, which flows into the German Ocean, while a still smaller piece in the north-west is drained by the Stour, which is a tributary of the Severn, which drains into the Western Sea.

The Thames basin contains about 5,062 square miles. The river takes its rise near the Foss road, from the oolitic limestone rocks of the Cotswolds, the escarpment of which is the western boundary of the basin. The reputed source of the Thames is in Trewsbury Mead, about three miles south-west of Cirencester. The Thames head, which Leland called the very head of Isis, is only 330 feet above the sea level. From this point to the Nore, the river measures 210 miles. For 110 miles of its course it touches the counties of Oxford and Berks, that is, from St. John's Bridge, near Lechlade—where was formerly a priory of Black Canons—to Old Windsor. From Lechlade to Oxford its bed is principally excavated in Oxford clay, the escarpment of the coralline oolite overlooking it on its southern side, while the Faringdon Clumps, planted by the poet Pye, and the bold headland of Wytham, and the fir-topped Hirst of Cumnor, so often alluded to by Matthew Arnold, are prominent objects on its southern side.

Between Oxford and Windsor the river cuts its way through successive bands of strata, often at a direct angle to their strike.

In its progress through our district the Thames receives many tributaries. Among these may be mentioned the Windrush, which, like the Thames, takes its rise from the Cotswolds, and is the largest affluent of the Thames. Drayton called it the nitrous Windrush. In its rather straight course through Oxfordshire it passes by Burford, which has a most handsome and interesting church, and through a country which was, at the beginning of the century, open downs, covered with short sweet grass and redolent of thyme, where *Anemone pulsatilla*, the musk orchis, the field rag-wort, the purple milk vetch, and spider orchis grew, but which now, alas! are bleak tracts of arable ground, with only an occasional strip of grass by the road-side to tell of the former vegetation. In such places *Stachys germanica* is still to be found. Passing Witney, whose ancient industry of blanket manufacturing was fostered by its water, the Windrush enters the Thames near Cokethorpe. The Evenlode, another tributary, brings in its turbid waters, gathered at its commencement from a wide tract of lias, which forms an obscure and low, and not very recognisable watershed between the Thames and Severn, about 450 feet above the sea between the "mercat" town of Stow and Icomb. The Evenlode runs its course of thirty miles in winding sweeps, whose general direction is almost parallel to that of the straighter stream of the Windrush. It passes by Churchill, the birthplace of Warren Hastings and William Smith, the father of geological science, and, washing the ruined Cistercian monastery of Bruern Abbey, glides under the once extensive forest of Wychwood, and in its course by Stonesfield quarries to Handborough passes through well-wooded and picturesque country, forming part of the demesne of historic Woodstock, itself lending a great charm to the scene by its beautiful curves, bordered by terraced slopes, whose hanging woods are here and there adorned with the pencilled flower of the wood-vetch, or starred with the rare *Gagea*. Wychwood contains two species of *Cynoglossum*, *Atropa belladonna* in plenty, and both *Helleborus fœtidus* and *viridis*. The curious tooth-wort, *Lathræa*, is also found there, as well as the rare *Salvia pratensis* and the limestone polypody. The Evenlode enters the Thames near Cassington, once the home of the Percys of Northumberland. From this spot the Thames curves in a bold sweep to the northwards, round the beautiful woods of Wytham. These woods are situated on the sides of an eminence, once the

site of a castle belonging to Cynewulf, King of the West Saxons, commanding extensive views of the valley of the Upper Thames. They are very interesting from a botanical point of view, containing as they do *Atropa*, *Hyoscyamus*, *Verbascum thapsus*, *Daphne laureola*, *Samolus*, *Astragalus glycyphyllus*, *Monotropa*, the white-flowered helleborine, the bee, the frog, the marsh, and butterfly orchis, and *Carex pendula*.

Near Wytham is Godstow, where *Aristolochia* occurs, and the rare *Nitella macronata* has been found.

At Yarnton the Thames turns southwards to Wolvercote, where the maximum amount of water passing in flood time was estimated at over 70,000 cubic feet per minute.

The many small branches of the Thames at Oxford give a home to a rich variety of marsh plants, the chief varieties being *Limnanthes*, *Sium latifolium*, *Fritillaria*, *Utricularia*, *Hydrocharis*, *Rumex maritimus*, *Mentha pulegium*, *Polygonum minus*.

At Oxford the Thames receives another important tributary from Oxfordshire, namely, the Cherwell, which has a catchment basin almost equal to the Thames above Oxford, namely 600 square miles. It rises in Northamptonshire, near Charwelton, on the elevated tableland of lias, capped here and there with outliers of oolite, from which three springs send their waters respectively to the German Ocean, the English Channel, and the Bristol Channel.

At Abingdon the Thames is replenished by the Ock, a purely Berkshire watercourse, whose numerous sluggish streams drain the Vale of the White Horse, which is excavated for the most part in Kimmeridge clay. In this area *Doronicum pardalianches*, *Polygonum dumetorum*, *Sedum dasyphyllum*, *Calamintha nepeta*, *Wahlenbergia hederacea*, *Viola palustris*, *Equisetum sylvaticum* occur. Below Abingdon the Thames soon passes into cretaceous beds, and at Clifton Hampden flows past bold cliffs of conglomerate, formed by the greensand, to Dorchester, which is on the site of the Roman camp, Durocina, itself occupying an earlier British settlement, and which gave its name to the episcopal see founded by Birinus in 634. Under the walls of the magnificent church flows the Thame, which rises in the high ground of Quainton and Brill, and the lower chalk escarpment near Tring, in Buckinghamshire, drains in its flexuous course a very similar tract of country to that drained by the Ock in Berkshire. The river near Dorchester affords the beautiful Snowflake, and it is bordered by *Acorus calamus*, which I believe to be native by the Thames.

From historic Wallingford the Thames continues its southern course through a narrow and beautiful green valley adorned with fine elms and bordered by hills of chalk, often well wooded on the slopes, or studded with bushes of Juniper. These woods have belladonna, Solomon's seal, the butcher's broom, the monkey, soldier, bee, fly, frog, burnt, bird's-nest, and many other orchids, *Pyrola minor*, and *Pyrus torminalis*. The grassy slopes are resplendent with the chalk milkwort and horseshoe vetch, or here and there show *Anemone Pulsatilla*. *Lactuca virosa* is to be seen on the wooded banks, and in the more inland portions *Daphne mezereum* is native. In the course from Wallingford to Reading the Thames receives a small Berkshire stream called the Pang, so called from a Saxon word signifying pain on account of the hardness of the waters. From lovely Pangbourne, beloved by artists, where the bright but calcareous water of the Pang mingles with the greener coloured Thames, the parent stream passes on under the hanging woods of Whitchurch, and by Maple Durham's charming mill, and by the Elizabethan mansion of the Blounts to the busy town of Reading. A locality for *Galium sylvestris* is in this vicinity. At Reading another feeder of the Thames comes in, namely, the Kennet, bright for silver eels renowned, whose principal source is in the chalk downs of Wiltshire, but which has also two Berkshire tributaries, the Lambourne and the Enborne. The one rising near the seat of a castle of Alfred, and the ancient battlefield of Œscesdune, the other passes from High Clere, by the site of Falkland's last battle. In this area the bog myrtle, the *Rhamnus frangula*, two of the sundews, two *Utriculariæ*, and many other interesting plants are to be found.

From Reading the Thames passes by the hanging woods of Sonning, with *Dipsacus pilosus*, *Scirpus sylvaticus*, and passes under Shiplake's ancient bridge, near which grows the great dodder, and then receives the river Loddon, which Pope described as the "Loddon slow with verdant alders crowned," a stream of great charm, and extremely rich in vegetation. It is the home of the rare *Potamogeton fluitans*, *P. rufescens*, *Typha angustifolia*, *Carex stricta*, *C. axillaris*, *C. vesicaria*, etc., and a profuse growth of the lovely Snowflake. From Shiplake the Thames passes Henley, the most ancient town in Oxfordshire, and Park Place, situated on high ground 300 feet above the river. *Linaria repens* is plentiful here, as is *Hypericum montanum*, *Euphorbia*, *Esula*, *Dianthus armeria*, *Spiranthes autumnalis*, and *Viscum* are also in the vicinity. Between Hambledon and Marlow is

"that beautiful valley through which the Thames, not yet defiled by the precincts of a great capital, nor rising and falling with the flow and ebb of the tide, rolls under woods of beech round the gentle hills of Berkshire."

I may now just allude to the fact that the ancient culture of woad was carried on at Wantage until the beginning of this century, and that in a village near Didcot a small quantity of hops has been grown for many years.

The following plants found in our area are of especial interest to the pharmacist:—

Anemone pulsatilla, Helleborus viridis, H. fœtidus, Papaver somniferum, P. rhœas, Brassica alba, B. nigra, Cochlearia armoracia, Isatis tinctoria, Reseda luteola, Drosera, Linum catharticum, L. usitatissimum, Rhamnus frangula, R. catharticus, Sarothamnus, Melilotus, Daucus, Rosa canina, Œnanthe crocata, Apium graveolens, Cornus, Sambucus, Valeriana, Anthemis nobilis, Tanacetum, Artemisia absinthium, Inula helenium, Lactuca virosa, Taraxacum, Erythræa, Menyanthes, Borago, Symphytum, Datura, Hyoscyamus, Atropa, Solanum dulcamara, Verbascum thapsus, Digitalis, Leonurus, Marrubium, Mentha piperita, M. pulegium, Polygonum bistorta, Daphne laureola, D. mezereum, Aristolochia clematitis, Asarum europæum, Humulus, Ulmus, Quercus, Populus, Salix, Juniperus, Convallaria, Polygonatum, Colchicum, Acorus, Triticum repens, Lastræa filix-mas, Lycopodium.

The PRESIDENT said they could not expect the Conference to discuss this paper in the ordinary way, but he was sure they would be all ready to get up and express their thanks to Mr. Druce for the marvellous view he had given of so wide a subject. This paper had formed a most pleasing interlude to other papers, and it occurred to him that, as in connection with the British Association there were evening lectures which formed a great feature of their meetings, so it might be possible at future meetings to devote the Tuesday evening of the Conference to any special feature connected with the district in which they were assembled, where there was a man capable of dealing with any of the special features connected with the natural science of the neighbourhood, though he did not suppose they would always be able to find so capable a man as Mr. Druce. It was truly marvellous that he should be able to say so much in so short a time.

In the absence of the author, the following paper was read by Mr. Naylor :—

ANIMAL EXTRACTS.

By C. E. Stuart, B.Sc.

Notwithstanding the investigations and statements of Continental observers, the employment of extracts of animal origin in the treatment of disease had made but slow progress in England up to 1891. In that year, however, Dr. George R. Murray, of Newcastle-on-Tyne, treated a case of myxœdema by the hypodermic injection of an extract prepared from the thyroid gland of the sheep, and the phenomenal success which resulted is undoubtedly one main cause of the large amount of attention which has since been directed to various animal extracts. As it is the duty of the pharmacist to make himself acquainted with the origin, nature, and properties of every substance which the medical man may require to use in the treatment of disease, whether animal, vegetable, or mineral, I hope the following brief and incomplete memoranda and notes will not be considered out of place as a communication to this Conference.

The hypothesis on which rests mainly the use of animal extracts as curative agents is that of Brown-Séquard, namely, that "all the glands of the body, whether they have excretory canals or not, give to the blood useful principles, the absence of which is felt when those glands are extirpated or destroyed by disease." Later he, with D'Arsonval, extended this hypothesis to all parts of the body, and proposed to employ in the human being, whenever the action of an organ is wanting, liquids extracted from the same organ taken from animals in good health. Thus the testicle, in addition to its secretion containing spermatozoa, which passes away through the ducts provided for the purpose, is supposed to secrete also a watery fluid which is constantly being absorbed into the blood, and acts as a stimulant nervine tonic. Consequently Brown-Séquard advocated injection of this fluid into the system whenever symptoms indicated the need for such a tonic.

Again, it is stated that such glands as the ovaries, pancreas, kidney, have in addition to their own excretory functions also an influence in the general physiology of the system, through the medium of liquid secretions taken up from them by the blood. For example, a form of diabetes is believed to be connected with

disorder or destruction of the pancreas. In certain animals extirpation of the pancreas produces this form of diabetes. It is not, however, the loss of the pancreatic juice which enters the intestine through the duct of the pancreas to which the disease must be attributed, for ligaturing this canal does not produce the diabetes; hence the inference that the pancreas has an internal secretion which is of importance to the animal economy.

If we consider the ductless glands, the thyroid affords a typical example of the value of these internal secretions, and also of the success which follows the introduction of extracts from healthy glands into a patient who is suffering from the impairment or loss of function of his own glands.

As regards the nature of the secretions, the difficulty of isolating any definite substance from them is very great. The inorganic constituents do not present any remarkable feature, and the organic constituents are, as a rule, present in small quantity, and tests for their identification are vague and unsatisfactory. Even if separated and identified, it is not to be assumed that any product is an "active principle" until it has been subjected to careful and prolonged physiological and clinical tests.

The action of these secretions in the system has been assumed by Poehl to be due to the supposed presence in all of them of one principle typically met with in the testicular secretion, to which has been given the name spermine. This is absorbed into the system, and confers its special tonic powers. Spermine is a base which was discovered by Schreiner in the animal semen. It has been shown to be present in the thyroid body, pancreas, spleen, and ovaries, and it appears to be a normal constituent of the human body and circulates in the blood. However active it may be as a general tonic, it cannot, I think, be considered to be efficacious in cases of disease due to arrested function of special glands, such as the thyroid or the pancreas.

Another suggestion is that each gland has its own special active principle, which may be a ferment or an albumose; or, again, in certain cases it has been suggested that there are organic compounds of phosphorus which have been supposed to exert a tonic action.

Animal tissues in their normal healthy condition are aseptic, and it is therefore only necessary to pay the most scrupulous attention to cleanliness and antiseptic conditions to produce extracts which may be safely used. The required gland or organ must be dissected out from the body with knives and forceps

which have been sterilised in the flame of a bunsen burner, and the glass plates, glass mortars, measure glasses, scale pans, and every other article used must be cleaned with soap and water and rendered aseptic by soaking in a 5 per cent. solution of carbolic acid, and rinsing with a plentiful supply of distilled water which has been sterilised by boiling. The hands and arms of the operator should be scrubbed with soap and water, washed in the 5 per cent. carbolic water, and finally with sterilised water.

Thyroid Extract.

In making this the formula originally published by Dr. Murray is adhered to, because it furnishes a preparation which is active, concentrated, and retains its activity for a reasonable time, and also because it is essential for the manufacture of a good extract that absolutely fresh glands shall be used.

In preparing the glands it is best to get them cut from the freshly killed sheep rather than to trust to the butcher to send them in at his convenience, possibly after a few days' delay. As regards the small cysts occasionally found in the lobes, the matter they contain is not pus, but seems to be of a fatty nature; they are, however, for the sake of caution, better left out of the extract. Hypertrophied lobes, such as may be met with from time to time three or four inches long, should also be rejected.

The lobes after being cleaned from fat and connective tissue are sliced thinly and bruised in a mortar; for every lobe is added 1 c.c. of glycerin and 1 c.c. of sterilised water. The mixture is allowed to stand for twenty-four hours, and is then squeezed off through fine calico. The product measures 3 c.c. for every lobe, and is a thick, dull red, cloudy liquid.

For hypodermic use water containing 0·5 per cent. of carbolic acid takes the place of the plain water.

A powder which keeps well may be made by simply expressing the juice from the glands, mixing it with sugar of milk, spreading it in a thin layer on glass plates, and drying at 90° F. The weight of the dry powder may be made up to 1 gramme for every thyroid lobe employed. This is three times the strength of the liquid extract.

The investigation of the constituents and active principle of the thyroid gland has had results which are chiefly of a negative nature. According to Dr. Gourlay, *Journal of Physiology*, vol. xvi., No. 1, the thyroid extract contains—

1. A nucleo-albumin, coagulating at 50° to 57°, precipitable by magnesium sulphate and also by water from the gland pounded up with salt.
2. Very little proteid.
3. No mucin, the nucleo-albumin having been mistaken for this.
4. No proteose or peptone.
5. Possibly a ferment.

I have confirmed the first four results, but it is to be noted that the biuret reaction, indicating proteose or peptone, "rose-pink colour on the addition of traces of copper sulphate and some sodic hydrate," is readily obtainable if the thyroid lobes are not fresh.

As regards Dr. Gourlay's suggestion, "with all reserve," that the nucleo-albumin may be the active principle since it is found in the peculiar secretion of the gland, because it is the only part of the tissue that resists (partially at least) gastric digestion, I would remark that nucleo-albumin is not peculiar to the secretion of the thyroid, but may be obtained from almost any cellular organ, and it remains to be shown that this particular nucleo-albumin has properties differing from that obtained from any other source. Also, that it is quite possible that bodies which are destroyed by artificial digestion may be absorbed into the system through the stomach walls without change.

As regards the presence of a ferment, the powder prepared as described by Mr. White in his paper read before the Conference last year, by precipitating with calcium phosphate an aqueous extract of the gland, is stated to be active, and may contain a ferment. In my own experiments in search of the active principle, the following process has been adopted at the suggestion of Dr. G. Murray. One hundred thyroid lobes were sliced fine and allowed to stand for several weeks in absolute alcohol. The alcohol was poured off and the glands dried, when they were extracted with water. The aqueous extract was evaporated under reduced pressure at 30° C. to a small bulk, and poured into ten times its volume of absolute alcohol, producing a copious grey precipitate. This precipitate was again extracted with water and poured into alcohol, giving a second precipitate of less bulk, on which the extraction and precipitation were repeated, and the final alcoholic precipitate was dried and powdered. This process coagulates or gets rid of proteid and nucleo-albumin, together with lecithin and fat, and probably excludes bodies other than a

ferment; but as to the proof of this being one, no experiment parallel to those which can be made in the case of others is available. We must wait for physiological proof of its activity, and experiments in this direction are being conducted by Dr. Murray. The powder from 100 glands weighs ·792 gramme.

With respect to an improved formula for the preparation of thyroid extract, there is at present no published evidence that any method of preparing it gives better results than Dr. Murray's original formula.

Brain Extract.

The method I have used for the preparation of a brain extract has been to take the brain of a rabbit, slice it, and rub it in a mortar with 1 cubic centimetre of glycerin, and 1 cubic centimetre of 0·5 per cent. carbolic acid to every gramme of its weight. Allow to stand twenty-four hours, and squeeze with strong pressure through fine linen. This is somewhat similar to the method of preparation used by Babes, who made an emulsion of the sterilised brain with five parts of bouillon (*Deutche Med. Woch.*, July 28, 1892).

The product is a pinkish white emulsion, consisting of almost the whole brain substance, there being left on the linen chiefly membrane. In seventy rabbits I find the average weight of the brain to be 8·57 grammes, the highest being 11·7 and the lowest 7·2 grammes, and the average yield of the cerebrine alpha was 23·5 c.c. The s.g. of the extract is 1·087 Ten-minim doses of this extract have been injected with good effect in cases of neurasthenia, locomotor ataxy, and other nervous cases.

This preparation contains in solution a little proteid, and in suspension protagon, lecithin, cholesterin, and cerebrin, and is most interesting on account of its complex character, the definite nature of its chief constituents, and the freedom from irritation and abscess following on the injection of its considerable proportion of solid matter under the skin.

Dr. J. Althaus in his paper on this extract (*Lancet*, December 2, 1893), which, as above prepared, he calls cerebrine alpha, suggests that its action on the nervous system may be twofold, and due, first, to the injection of a highly specialised pabulum of nervous matter; and second, to the decomposition of the lecithin and protagon which it contains through the alkali of the blood into choline, glycerophosphoric acid, and stearic acid. Choline

is an alkaloid which acts as an antitoxin by reason of its oxidising action on the blood. In small doses it produces pyrexia.

It is an interesting fact in this connection that Dr. A. Robin, of Paris, has recently published successful results of the use of glycerophosphoric acid and its salts in nervous cases (*Lancet*, May 5, 1894). Hence both the choline and the glycerophosphoric acid may be active in the extract.

Spinal Cord Extract.

This is similar in its nature and effects to the brain extract. Its preparation is more troublesome, as the spinal cord must be obtained by carefully cutting away the upper portion of the vertebræ of a rabbit with a bone forceps until the whole cord is exposed, when this may be lifted out together with the medulla oblongata; the arachnoid membrane may readily be stripped off and the cord divided and treated as the brain extract. Dr. Althaus has named this myeline alpha to distinguish it from the histological "myeline," a constituent of the central nerve fibre. The average weight of the spinal cord I found to be 4·68 grammes, the highest being 6·2 grammes and the lowest 3 grammes, and the average yield of myeline alpha was 12·3 c.c.

Spleen Extract.

On opening the body cavity of the rabbit in the usual position for dissecting, and moving the bowels to the left, the spleen will be seen as a narrow reddish-brown organ lying just behind and across the stomach, which is easily dissected away from the peritoneal membrane in which it is folded. It has a characteristic bright red colour, and varies considerably in size, being from $1\frac{1}{2}$ to $2\frac{1}{2}$ inches long, and from $\frac{1}{5}$ to $\frac{3}{5}$ of an inch in diameter. It weighs on an average ·89 gramme. An extract may be prepared from it by rubbing it up with enough of a mixture of equal parts of glycerin and $\frac{1}{2}$ per cent. carbolic acid to make, after squeezing through linen, one fluid drachm of product for each spleen. This extract has been used hypodermically in doses of ten minims in leucocythemia, enlarged spleen, and Hodgkin's disease.

Supra-renal Extract.

Immediately behind and just above the kidneys in the rabbit will be found on either side the supra-renal capsule, a small oval pale yellow body, which can easily be dissected out. In cases where the animal is very fat the organ is not so readily seen on a

first inspection, but a small amount of dissection will soon reveal its presence, and when once it is recognised and known it cannot afterwards be overlooked. Each supra-renal body weighs on an average ·25 gramme, and on cutting it across it is seen to be composed of two distinct parts, an outer, thicker, cortical part of yellowish colour, striated radially, and an inner, thinner, medullary part of darker colour. On bruising the bodies in a mortar the substance has a yellowish-brown granular appearance. The extract has been made by slicing and bruising the capsules and adding a sufficient quantity of equal parts of glycerin and a 0·5 per cent. solution of carbolic acid to make, after expression as above, 4 c.c., or 1 fluid drachm for each supra-renal body. This has been used in 10-minim hypodermic doses in Addison's disease.

Pituitary Body Extract.

The pituitary body is a small pink mass at the base of the brain. It is a very small body; in the sheep it weighs ·75 gramme, and this is a convenient source for making the extract. The sheep's head is opened, and the brain removed, all nerves and connections on the under side being divided with a scalpel. The pituitary body will be found to have been left in the skull in its little depression almost covered over with thick membrane, which has to be cut away before the pituitary body can be freed. It is treated as the brain, and has been used in acromegaly.

Pancreas Extract.

The pancreas of the pig is the most convenient for making extract. It should be most carefully freed from fat, finely divided, and treated as brain extract. It furnishes a milky extract, which contains, besides the digestive ferments of the pancreas, the special secretion which preserves the organs from diabetes.

Thymus Extract.

This gland may be obtained from the sheep or pig; it is important that it should be taken from a young animal, as it atrophies in the adult. When treated as the brain it yields a thin, whitish extract, which has been used in similar cases to the thyroid extract, but with indifferent results.

Kidney Extract.

In making this extract, the kidney should be cut open and several deep incisions made into its substance, so as to allow of a thorough washing out of the pelvis of the kidney to free it from

excreted matter. It may be then chopped fine and treated like the brain. I should like to remark here that as we know so little of the purpose and function of some of these organs, and absolutely nothing as to what is the active principle or principles in these extracts, an arbitrary standard of strength must for the moment be adopted and the dose adjusted to these strengths. I have been guided by the unqualified success which attended the strength adopted by Dr. George Murray for thyroid extract, and have made only slight modifications to suit the convenience of size and weight in other organs.

Bone Marrow Extract.

The development of red blood corpuscles seems to be a function which is chiefly carried on by the cells composing the red marrow of bones (Halliburton, *Chem. Phys. Path*, p. 265). It is natural, therefore, that this promising field for the manufacture of an extract should not be neglected. Dr. Fraser read before the International Medical Congress in Rome (*Brit. Med. Journ.*, June 2, 1894) a paper in which he showed the favourable result of giving red marrow by the mouth in quantities of three ounces daily in a case of pernicious anæmia.

As the cells of the red marrow from which the red corpuscles are derived are met with chiefly in the cancellous portion of the bones, such as the head or base of the femur, and other long bones, and less numerously in the actual fatty marrow in the hollow shafts of these bones, it is to be expected that an extract from this cancellous tissue should prove stronger in its action than the marrow itself, and therefore smaller doses be required. Dr. J. Dixon Mason publishes a note on this subject in the *Lancet*, March 10, 1894. Following his indications, an extract may be prepared by splitting the femur of a young animal, say the calf, and gouging or scooping out the red cancellous tissue at the head or base, pounding this fine in a clean iron mortar, and macerating the mass for a few days with glycerin in the proportion of one in ten with frequent agitation, when the extract is filtered through glass and made up by washing with glycerin to the necessary volume.

As the process of development of the red corpuscles is one in which the nucleated cells of the red marrow are altered, and assuming a rounded shape become blood discs and enter into the circulation, or according to another view, one in which these cells produce blood discs by a sort of budding, an explanatory hypothesis of the action of this extract must be that it contains a

substance which either stimulates the energy of marrow cells already in existence, or encourages the formation of new ones.

Testicle Extract or Orchitic Fluid.

I have left this until last, because it is an extract in which I have simply followed the strength (one in ten) and process published by Professor Brown-Séquard in the "Archives de Physiologie." I have used ram's testicles divested of their outer membranes, and to each gramme weight added 3 c.c. of glycerin and 6 c.c. of a 0·5 per cent. solution of boric acid. After macerating twenty-four hours, this mixture is filtered through sterilised filter paper, and then finally sterilised in the D'Arsonval apparatus, which has been described in the *Pharmaceutical Journal* (see vol lii., 1034).

The PRESIDENT said the author of the paper was not present, he regretted to say, but as animal extracts were being demanded by medical men, it became the pharmacist not only to be able to prepare them, but to qualify himself by a knowledge of physiology and the practice of dissection to do whatever the medical man required. Mr. White, of St. Thomas's, had published some work in connection with the thyroid gland, and they had seen allusions in which editors had run greatly in advance of Mr. White's own papers about it, especially with regard to the active principle. He was not sure they always knew what they meant when they talked about the active principle, but it was well to remember that not only the pharmacist, but the chemical physiologist or physiological chemist, was working in an entirely new region, and a region of intense interest scientifically. Nothing approaching it in interest, from a scientific point of view, had ever come into his pharmaceutical life. How long it would be before they received any light on these great problems he did not know, but he did know that it was necessary for pharmacists to be capable, in connection with these animal compounds, and even bacterial compounds, of producing whatever the medical man required in the treatment of his patient. Although it was easy to sneer and smile, and to refer to the time when various animal excreta were used, probably with a certain amount of superstition, at the same time the justification of experiments with regard to other animal compounds was found in the remarkable success to which he had already referred. With regard to the care required, he could not

say any words strong enough to impress on everybody who had to deal with these things not to relax it. The slightest decomposition which might occur in the thyroid glands was capable of producing the most tremendous effects of an undesirable character, and those who had read any literature on the subject would recognise that it was not a thing to be trifled with. The work should not be done on the commercial scale, but the pharmacist who managed these things must take on himself the responsibility from beginning to end, at any rate until they knew more about the chemistry of the subject. The author himself would, for several reasons, have preferred to postpone this paper for some years. At the same time, hurried as it was and imperfect, it was a valuable contribution to the Conference, and pharmacists could not begin too soon to turn their attention to things which might at any moment assume greater importance than that one extract had.

Dr. RIDEAL said one would have thought that a preliminary test for the presence or absence of ptomaines would have been sufficient to insure the pharmacist dealing with a satisfactory gland, but from Mr. Stuart's paper it would appear that it would be necessary to go further back than the presence of ptomaines in testing as to its efficiency, because he gathered from the paper that it was necessary to insure the absence of albumose and peptones, or, at any rate, bodies giving a biuret reaction, before you could be certain the thyroid gland was one which would be safe. If that were so, it was of great importance, and the conclusion arrived at by Mr. Stuart ought to be of great value to those engaged in making these preparations.

Mr. GERRARD said those who might wish to make a preparation which was perfectly accurate and reliable for internal administration might do so by taking fresh glands, carefully mincing them, removing as much fatty matter as possible with the knife, then washing out any remaining fatty matters by means of such solvents as ether or benzol, spreading the gland out thinly on a sheet of glass, and submitting it to a drying process at a low temperature. As soon as the scale was perfectly dry, if rapidly pulverised it could be sifted or mixed with a certain amount of well-prepared sugar of milk; it might then be bottled, and you would be sure of having a reliable preparation which any pharmacist might prepare for himself. That, however, should not be supplied for making hypodermic injections. In such circumstances it was essential to follow out perfectly the careful process suggested by the author.

Mr. WILLIAMS said in making the preparation of the thyroid in

powder a convenient method was to press the gland in a clean press, when the juice might be conveniently collected and allowed to form a thin layer on glass plates or on a large photographic plate, and dried at a low temperature. It readily scaled, and that scale could be powdered and readily used. Of course there was much greater difficulty in following out all the precautions necessary in order to make a preparation which would be useful and safe for hypodermic injections.

The PRESIDENT said he was not competent to reply on behalf of the author of the paper, though he had paid a great deal of attention to the subject, but in reply to Dr. Rideal he might say it was not a question of the presence of ptomaines, but of the avoidance of danger, and it was safer to eliminate danger from the beginning than to trust, in their present condition of knowledge, to checking themselves by chemical means at any subsequent stage.

Mr. Stuart was thanked for his communication.

The next two papers were considered together after being read by their respective authors.

LEONURUS CARDIACA.

By E. M. HOLMES, F.L.S.,

Curator of the Museum of the Pharmaceutical Society.

My attention was first directed to this plant by its very bitter taste. The descriptive character of its specific name suggested that (like *Convallaria*) it might possibly possess some beneficial action on the heart, and that it would be worth while to subject it to a chemical examination, at all events so far as to determine whether its properties are due to an alkaloid or a glucoside, as the bitter principle has not been isolated.* The plant grew like a weed in the sandy soil of my garden, sowing itself everywhere, so that I was able to supply sufficient for a preliminary investigation, which Mr. W. A. H. Naylor kindly undertook.

Concerning its history as a medicinal plant there is not much to be said. The earliest herbal in which I have been able to find an account of the properties of the plant is the "Botanicon" of Theodore Dorstenius, dated Frankfort, 1540, in which, on p. 65, an excellent figure of the plant is given. Ten years before it was

* "National Dispensatory," 1890, p. 936.

called *Marrubium mas* by Brunfels. By other authors it was called *Marrubium nigrum*, whilst *Ballota nigra* was distinguished as *Marrubium nigrum fœtidum*. It is very doubtful whether the plant was known to possess medicinal properties by the early Arabian and Greek physicians. Dorstenius says that it is called *cardiaca* because it powerfully relieves palpitation and pain in the region of the heart. Culpepper, in the "English Physician Enlarged," published about one hundred years subsequently (1653), writes: "There is no better herb to drive melancholy vapours from the heart, to strengthen and to make the mind cheerful, blithe, and merry. The powder thereof to the quantity of a spoonful drunk in cold water is a wonderful help to women in sore travail, and also for suffocations or risings of the mother, and from these effects it most likely got the name of motherwort." He also states that it possesses diuretic and emmenagogue properties, acts as an expectorant, and kills worms, and also relieves cramps and convulsions. In J. Hill's "Flora Britannica," published about one hundred years later (1760), which is interesting as being the first Linnean flora published in England, the author remarks (on the authority of D. Bowle) that the plant is good for hysteria.

But *Leonurus cardiaca* seems to have been rarely used by medical practitioners. The only list of simples in a London Pharmacopœia in which I have found it is that published in 1721. It also occurs in the Paris Codex of 1758. Nevertheless, its reputation as a cardiac remedy appears to have extended to the Continent, since the names in French (Agripaumé cardiacque), German (Herzgespann), and Dutch (Hartgespann) all indicate the same property.

In answer to inquiries I have made as to its present use as a herb, I learn from Messrs. Potter and Clarke that it is still used to a considerable extent (about 1½ ton annually) in England; also in the United States, and in Germany, and to a small extent in France. It is supplied in the form of herb, fluid extract, and extract. Mr. Ransom also informs me that the extract is sent to Australia. There seems to be some ground, therefore, for supposing that it really may be useful in medicine. The exact nature of its usefulness must of course be determined by the medical profession and by physiologists. As yet there has not been an opportunity of investigating the action of the pure active principle. Messrs. Potter and Clarke have, however, kindly offered to supply herb, fluid extract, or extract for the purposes of therapeutical and physiological investigation.

It may be added, in conclusion, that an allied species, *L. lanatus*, is (according to the authors of the "National Dispensatory," 1890, p. 934) regarded as a vascular stimulant and as a general tonic. It is employed in dropsy, especially of hepatic origin, and is stated to impart to the urine a dark brown colour. It is also used in chronic gout and rheumatism, and to relieve internal obstruction.

In King and Lloyd's "American Dispensatory," *Leonurus cardiaca* is spoken of very highly as an emmenagogue, and is said to be of value in hysteria, nervous complaints, delirium tremens, nervous excitability, chronic diseases attended with restlessness, wakefulness, spinal irritation, and neuralgic pains. Messrs. Potter and Clark state that in two or three cases that have come under their notice it has proved very beneficial in palpitation of the heart, etc. The evidence obtainable seems therefore to indicate that the plant is worthy of further investigation.

EXAMINATION OF LEONURUS CARDIACA.

By W. A. H. Naylor, F.I.C.

More than a year ago Mr. E. M. Holmes, F.L.S., Curator of the Museum of the Pharmaceutical Society, handed over to me about twenty pounds of fresh motherwort, which he had grown, with the request that I would subject it to a general examination.

The fresh herb was pressed, and to its juice was added 20 per cent. of rectified spirit as a temporary preservative. After making a few preliminary tests, the following mode of procedure was decided upon:—The "succus" was evaporated over a water-bath to a soft extract (A). This extract was treated by agitation with successive portions of absolute alcohol, and the several portions were united and distilled, leaving two residues, one soluble and the other insoluble in alcohol.

Aa. *Residue Soluble in Alcohol.*—It was noted that small crystals separated out during the distillation of the alcohol, these on examination proved to be potassium chloride. The alcoholic residue was exhausted with ether in the cold, which, after evaporation, left a reddish yellow substance that was sticky, soluble in chloroform, alcohol, and ether, and insoluble in petroleum ether, benzol, and water. It was intensely bitter, and could not be provoked into crystallising from any of its solvents (1). The portion which did not dissolve in the ether was treated with a 5 per cent. aqueous solution of sulphuric acid, in which it was for the most

part soluble, filtered, and the filtrate shaken up with chloroform. The chloroformic residue presented the appearance of a dark reddish-brown, bright, hard varnish, intensely bitter. Ether removed the principle to which it owed its bitterness, when it was found to correspond with Aa (1). The chloroformic residue not taken up by ether after re-solution in chloroform and evaporation was brittle, and by trituration yielded a dark brown powder, soluble in alcohol, from which it could be recovered only in an amorphous form (2). The acid solution was next rendered alkaline with ammonia, and agitated with chloroform. The extract left after evaporation of the chloroform, when purified from ether, was free from bitterness, of a pale straw colour, not sensibly alkaline, readily soluble in acidified water, alcohol, and ether. So far all attempts to obtain it in a crystalline form have failed. Its solution in acidified water gives copious precipitates with ammonia solution of iodine and potassium iodide, Thresh's reagent, phosphomolybdic acid, platinum perchloride, chloride of gold, iodide of cadmium and potassium, potassium metatungstate, and picric acid. With mercuric and potassium iodide it gives no reaction. It may be purified by precipitating its solution in weak hydrochloric acid with solution of iodine and potassium iodide, and recovering it from the precipitate by decomposition with sodium thiosulphate (3).

The portion which, in the first instance, was not dissolved by the 5 per cent. solution of sulphuric acid yielded to chloroform a bitter principle, which had the characters and solubilities of Aa (1). The aqueous alkaline liquor, after neutralisation with sulphuric acid and evaporation to complete dryness, and subsequent treatment with absolute alcohol, left a dark-looking hygroscopic residue, which did not possess characters that would entitle it to be described by a more definite name than extractive (4).

Ab. *Residue Insoluble in Alcohol.*—This was treated with water to exhaustion and the solution filtered. There was left a small grey pulverulent residue, which consisted of lime phosphate. The aqueous filtrate, after evaporation to a convenient bulk, was precipitated with lead acetate, and the precipitate was collected and washed. Both the lead precipitate after suspension in water and the lead filtrate were decomposed by sulphuretted hydrogen. After removal of the lead sulphide, the separate filtrates were evaporated to a treacly consistence and marked "aqueous extract" and "aqueous precipitate extract" respectively. The aqueous precipitate extract was strongly acid. It was dissolved in water, neutralised with soda, and precipitated

with calcium chloride solution, shaken vigorously, allowed to stand, and filtered. The filtrate was boiled, when a further separation took place, and was filtered hot. The filtrate, when cold, was shaken with three times its volume of alcohol, which caused an immediate precipitate. These several precipitates were recognised as tartrate, citrate, and malate of lime. The filtrate from the last-named precipitate was evaporated to dryness and exhausted with boiling alcohol, which sufficed to remove every trace of calcium chloride. The residue was unaffected by any solvent except water, in which it dissolved completely and readily. When dried over a water-bath it was a reddish-brown, hard mass, which by exposure gradually softened through absorption of moisture. It had a sour, slightly saline taste.

The Aqueous Extract.—This semi-liquid extract was treated with four times its volume of alcohol, the alcohol was recovered by distillation, and the remainder evaporated, when there was left a residue of a bright dark-red colour, bitter, and completely soluble in water. After removal of the bitterness by ether it was dissolved in water, precipitated with lead subacetate, and filtered. Both the filtrate and precipitate were decomposed with sulphuretted hydrogen, filtered, and evaporated. The portion precipitable with lead subacetate presented the characters of pectinous substances, and the portion not precipitable with basic acetate was simply extractive.

The residue of the aqueous extract left after treatment with alcohol was dissolved in water and precipitated with lead subacetate. Both the filtrate and the precipitate were decomposed with sulphuretted hydrogen and severally concentrated to a thick consistence by evaporation. The lead filtrate extract, after standing a few days, was studded with crystals. These crystals, when isolated from the extractive in which they were imbedded, were in the form of thin needles, colourless, very soluble in water, insoluble in alcohol, and consisted of a potassium salt of an organic acid. A solution of the salt was not precipitated by barium or calcium chloride or lead acetate. It was converted into a calcium salt, which was decomposed with dilute sulphuric acid. Unfortunately, through an accident at this stage, sufficient crystals were not recovered to admit of their identification.

B. The marc left after expression of the juice was carefully dried and exhausted with rectified spirit. The spirit was distilled off, and the resultant extract was treated at the temperature of the water-bath with a 5 per cent. solution of sulphuric acid until

the soluble portion ceased to react with a solution of iodine in iodide of potassium. After filtration, the filtrate was made alkaline with ammonia, and agitated with three successive quantities of chloroform, which were separated, mixed, and distilled. In its appearance, its indifference to litmus, its solubilities, its refusal to crystallise, and its reaction with alkaloidal reagents, it corresponded with Aa (3).

The portion not dissolved by the solution of sulphuric acid, after washing with water, was dried over a water-bath and exhausted with petroleum ether. That which did not pass into solution was treated with ether. The residue from the petroleum ether was largely soluble in absolute alcohol, and after filtration and evaporation from this solvent there was left a fixed liquid oil, green from the presence of chlorophyll, soluble in ether, bisulphide of carbon and alcohol. The residue from the ether yielded to bisulphide of carbon a considerable quantity of a soft resin, soluble in chloroform. There was finally left an amorphous, blackish, crumbly substance, upon which neither the petroleum ether nor the ether exerted any solvent action. Alcohol removed therefrom traces of chlorophyll, citric acid, and malic acid, and chloroform withdrew a hard, bright, brittle, resinous principle, which after washing with ether could be readily reduced to powder. In its characters and solubilities it agreed with Aa (2). The insoluble residue was not further examined.

C. This consisted of the extract obtained by exhaustion of the marc from B with ether, and distilling off the solvent. Petroleum ether dissolved the major portion of this extract. That which did not pass into solution was treated successively with alcohol and chloroform. Of these solvents the former removed a hard, chippy substance, which yielded to ether a bright waxy residue, while the portion insoluble in the ether was brittle, and corresponded with Aa (2); the latter solvent (chloroform) withdrew a substance more akin to a wax than a resin. The petroleum ether residue was a mixture of fatty and waxy constituents. It was saponified by prolonged boiling with a solution of potash in alcohol, allowed to cool, and the matter which separated was collected on a filter and washed with rectified spirit (C 1). To the filtrate water was added, and the alcohol evaporated off. It was then shaken up three times with ether, which on evaporation gave a yellow crystalline residue (C 2) that readily dissolved in alcohol and gave on cooling a crystalline magma which under the microscope was seen to consist of minute needles arranged in the form of rosettes,

and affected by polarized light in a manner similar to fatty acids. This was evidently a decomposition product of the wax. The filtrate, after the withdrawal of C 2, was acidified with hydrochloric acid and warmed. The separated and crystalline fatty acid when cold was collected and purified from petroleum ether. The portion not taken up with petroleum ether, after solution in chloroform, agreed in its characters with Aa (2).

D. The marc from C was exhausted with cold water, and the liquor evaporated. In this extract, excepting a considerable quantity of a Fehling reducing substance, nothing of importance was found that has not already been referred to as present in the "succus."

The total results obtained may be compressed into a statement of the constituents separated in the course of this examination. They are: *Definite*—Potassium chloride, calcium phosphate, citric, tartaric, and malic acids. *Proximate*—Bitter principle, hard resin soluble in chloroform insoluble in ether, soft resin soluble in chloroform and ether, alkaloidal substance, potassium salt of an organic acid, fixed oil, wax soluble in petroleum ether, wax insoluble in petroleum ether, extractives, one soluble in alcohol and water, two soluble in water only.

Mr. DRUCE said he believed motherwort was first mentioned as a British plant in Gerrard's "Herbal," and the place where it was found to grow was near Oxford.

Mr. WILLIAMS said an American author had contributed an examination of motherwort, but his results did not seem very satisfactory. He would ask if Mr. Naylor looked for volatile oil, because such oil was mentioned in the communication to which he referred.

Mr. HOLMES said quite probably the American plant examined belonged to a different species.

Mr. MARTINDALE said he expressed some juice from some plants which Mr. Holmes had sent him, and had sent the extract to Aberdeen for physiological investigation, but he had not yet received any reply.

Mr. GERRARD said Mr. Naylor did not mention whether he had examined these plants for glucosides, but he assumed that he had. The bitter principle might be a glucoside, for it often happened that you got a sort of non-alkaloidal bitter principle, which when freely examined turned out to be a glucoside. Again,

he would ask him whether the residue which he had shown represented the whole amount obtained from the 28 lbs. examined, or only a fraction.

Mr. NAYLOR said it was only a fraction.

Mr. GERRARD said sometimes a plant, when worked in large quantities, would give a small amount of matter and reactions of an alkaloidal character, which would not give a precipitate with Mayer's reagent. In such cases, where the yield was exceedingly small, it was scarcely worth wasting time on further investigation. It might often turn out that the active principle was to be found in some other body rather than in the small trace of alkaloid present.

Mr. ALCOCK asked if Mr. Naylor had examined for caffeine, seeing that that corresponded with many of the alkaloidal tests, except Mayer's. He could not see any connection between caffeine and motherwort.

The PRESIDENT said he was sure they would all wish to emphasise the vote of thanks to be given to the authors of these papers. Those who knew the amount of executive work done by Mr. Naylor would know that they owed him a large debt of gratitude for having found time to prepare a paper of this sort. He would say, with regard to Mr. Gerrard's suggestion that it was labour wasted when they found such a small quantity of alkaloid, that, as a question of scientific interest, it would be a pity to throw away any article from which they obtained even 5 grains, which might be an active principle, and might throw some new light on some chemical or physiological problem.

Mr. NAYLOR said, after some little experience of what was known as plant analysis, he had learnt to be very cautious in speaking of any principle or constituent one might have isolated as definite. For instance, this bitter principle he had managed to purify by various solvents, but at the present time it gave a reaction with Fehling's solution, and he could not possibly say whether that was due still to some adhering impurity, or whether it was due to the body itself. The samples he had produced were taken from a bulk. In some instances he had fair quantities of these separate constituents, and simply brought these samples to represent them. He did not know the amount of alkaloid separated, but he should think it was quite sufficient to encourage one to extract the larger supply from ½ cwt. or more of the plant. Of course he had regard to the fact that it might be caffeine, from the negative reaction which Mr. Alcock mentioned, but he was unable to identify it as such.

The following paper was next read :—

THE CONDITIONS OF PAPAIN DIGESTION.

By S. Rideal, D.Sc. Lond., F.I.C.

Since communicating some notes on papain digestion to the North British Branch of the Pharmaceutical Society (*Pharm. Journ.*, April 7, 1894), I have had an opportunity of further studying the behaviour of this interesting vegetable ferment, and the fresh results which I have obtained seem to clear up some of the points which my earlier examination showed to be still doubtful. The pure ferment has not yet been isolated, and at present it is impossible to determine the amount of papain in commercial samples. In this respect papain resembles pepsin, and its value as an aid to digestion can only be measured in terms of its relative activity to different brands of pepsin. The term papain, although strictly belonging to the pure ferment, is also used to denote the mixture obtained from the inspissated juice of the papaw fruit, and as an equivalent to papayotin, which seems to be another preparation from the *Carica papaya* tree. The commercial papain used in these experiments appears to contain a uniform amount of active ferment, as the different samples I have examined do not differ very much from one another in digestive activity.

In most of the earlier work with this ferment, comparisons have been made with pepsin under conditions which are known to be conducive to the rapid digestive action of the animal ferment, ignoring altogether the fact that papain from its mode of occurrence and general properties is an enzyme which may have conditions favourable to its action which are altogether different to those which obtain for pepsin. It has long been known, for example, that papain, unlike pepsin, digests in an alkaline fluid, and this fact alone shows that it is more strictly comparable to trypsin than to pepsin. Its analogy to trypsin cannot, however, be pressed too far, since it does not appear to possess a fat-splitting power. In some recent experiments on the action of papain on milk and cotton seed oil emulsion, I found that even after four hours at a temperature of 40° C. there was no evidence of the production of any fatty acid, so that, unlike trypsin, papain does not possess the power of hydrolysing fats. I have been unable, also, to find any information as to its action on the carbohydrates, although from its vegetable character one might expect it to

possess some diastatic action. It would be interesting to determine whether any of the preparations of papain have any amylolytic action, as such an investigation would aid in determining whether there are several enzymes present in crude papain. Although its hydrolytic action on fats and carbohydrates is thus somewhat remote, there is no doubt of the well-marked proteolytic action which papain possesses. It is the purpose of the present communication to define a little more closely the conditions which are the most favourable for its proteolytic action.

1. Influence of time. Rate of digestion.

In these experiments coagulated white of egg was employed as the material for digestion. The quantity of water present in the finely rubbed sample was determined in the ordinary way by drying at 100° C. until the weight was constant. Weighed portions of the same sample were then transferred to wide-mouthed bottles fitted with corks, and three times the weight of distilled water added, together with 1 per cent. of papain. The bottles were then placed in a chamber heated to 37° C., and removed after different intervals of time, when the contents of the bottles were transferred to a muslin filter, washed, dried, and weighed. The following table shows the results obtained in two such complete experiments:—

Percentage of Undigested Albumin.

Time in Hours	Papain 20. 8 gm. albumin. 24 c.c. water. 0·08 gm. papain.	Papain 21. 15 gm. albumin. 45 c.c. water. 0·15 gm. papain.
1	25	19·3
1½	23·8	10·6
2	22·8	7·6
2½	22·3	4·2
3	21·6	3·8
3½	20·9	3·2

It will thus be seen that in both cases in less than an hour 75 per cent. of the coagulated albumin had been converted into a soluble form, and that at the end of three hours the digestive action becomes so slow that for practical purposes it may be regarded as completed at the end of that time. It will also be noticed that, although both these samples up to the end of the first hour had approximately the same rate of digestion, the action was pushed to a far greater extent by sample 21 than by sample

20 after this interval of time. The slower rate obtained with papain 20 was due to the fact that the albumin was coagulated in the bottles used, and thus exposed a smaller surface to the digestive action.

2. Influence of temperature.

In these experiments egg albumin coagulated and squeezed through wire gauze was employed, and the bottles containing a mixture of 15 grammes albumin, 45 c.c. water, and 0·15 gramme papain were kept for two and a half hours at the different temperatures given below :—

Temperature.	Papain 26. Percentage undigested.	Papain 27. Percentage undigested.
28° C.	68·6	65·1
32° „	68·0	64·1
38° „	67·2	63·2
40° „	67·1	63·1
42° „	70·0	63·7
48° „	73·5	71·6

In both cases the maximum amount of digestion took place when the temperature was 40° C., whilst at higher temperatures than this the activity of the papain rapidly diminishes. Between 30° and 40° C. the rapidity of the action gradually reaches its maximum. It is interesting to note that the temperature at which the digestive action is most pronounced is approximately the temperature of the blood. This is a remarkable fact, and a coincidence which it is difficult to explain. Diastase, the other vegetable ferment which has been studied carefully, does not begin to lose its power of hydrolysing starch until the temperature of 63° C. is reached. I have not yet had an opportunity of examining bromelin, the vegetable ferment which appears to be most allied to papain, but it will be interesting to see at what temperature its activity is the most pronounced.

3. Influence of the amount of ferment.

Although 1 per cent. of papain has a very marked digestive action, if the amount of ferment relatively to the amount of proteid to be digested be increased, there is a slight increase in the amount of digestion that takes place, as shown by the following results :—

Influence of the Amount of Ferment.

15 *grammes Egg Albumin* + 45 *c.c. Water.*

Amount of Ferment in Grammes.	Percentage of Ferment to Proteid.	Percentage Undigested.	
		Papain 32.	Papain 34.
·15	1·0	68·6	56·4
·25	1·7	63·0	52·9
·35	2·3	57·7	49·5
·45	3·0	55·7	46·5

There is therefore but little advantage to be gained by increasing the amount of ferment above 1 per cent. on the wet proteid to be digested.

4. Influence of the amount of water present.

In these experiments 15 grammes of egg albumin, prepared as already described, was employed, and 0·15 gramme papain, with varying amounts of water. Digestion was allowed to proceed for three hours at 40° C. :—

Vol. of Water in c.c.	Percentage Undigested.	
	Papain 35.	Papain 36.
25	59·4	44·2
35	64·6	48·7
45	67·1	50·0
55	71·5	55 0

It is therefore evident that the amount of water present has a retarding effect upon the proteolytic action, and that the digestion proceeds most rapidly, *ceteris paribus*, in concentrated solution. In this respect papain digestion is very different from that of pepsin, as it seems established that peptic action takes place best when the quantity of water present is far in excess of the quantities employed in the above experiments.

5. Influence of the presence of other substances upon the rate of digestion.

In all the above experiments, distilled water was the medium employed in which the digestive action took place. It has been long known that the presence of small quantities of hydrochloric acid and sodium carbonate accelerate the proteolytic action ; but, so far as I have been able to ascertain, few experiments have been published upon the quantities which are found to give the most satisfactory results.

(*a*) To determine the influence of an alkaline medium on the

action of the papain, 15 grammes of egg albumin was digested with 0·15 gramme papain in the presence of 45 c.c. of a solution containing known amounts of sodium carbonate and bicarbonate. Sodium hydrate was also tried, but it was found even in 0·25 per cent. solution to gelatinise the albumin and render the fluid difficult to filter. The results with the two carbonates of sodium are shown below.

Strength of Alkali.	Percentage of Albumin undigested in presence of:— (I.) Sodium Carbonate.	(II.) Sodium Bicarbonate.
0·1 per cent.	68·7	58·5
0·25 „ „	63·3	56·4
0·5 „ „	58·3	45·7

In these experiments the same papain was used, and the digestion allowed to proceed for three hours at 40° C. They show that sodium bicarbonate is more favourable to the action than the neutral carbonate, and that the digestion is augmented with the increase of the bicarbonate up to ·5 per cent. We have not used a stronger solution, but as doubling the amount of bicarbonate has only increased the amount of digestion from 44 to 54 per cent., a further addition of bicarbonate is not indicated.

(*b*) *Acid Digestion.*—In normal gastric juice there is believed to be about ·3 per cent. of free hydrochloric acid, but in artificial digestion Brücke showed that, *ceteris paribus*, a solution containing 0·086–0·088 per cent. was the most favourable strength for the digestion of fibrin, and 0·12–0·16 for coagulated egg albumin. Kühne and Chittenden, on the other hand, state that as high as 0·5 per cent. of hydrochloric acid may be used with advantage. Acetic and tartaric acids act more feebly (Gamgee, *Phy. Chem.*, vol. ii. p. 84). I have tried the influence of these three acids and boric acid on digestion by means of papain, with the following results:—

Strength of Acid by weight.	Papain 21. Acetic Acid, B.P.	Percentage Undigested. 15 grammes egg albumin. 0·15 gramme papain + 45 c.c. acid. Tartaric Acid.	Boric Acid.	Hydrochloric Acid, B.P.
0·1 per cent.	65·4	61·3	47·5	70·1
0·25 „ „	56·0	53·2	47·3	51·5
0·5 „ „	53·9	50·7	43·7	10·2

It will be seen that with each of these acids (1) the amount digested increased with the amount of acid present; (2) that in the presence of boric acid the quantity of this acid present made the least variation in the amount of digestion; (3) that with 0·5

per cent. hydrochloric acid gives the maximum amount of digestive action. I hope to further extend these experiments with a view to ascertaining whether the differences observed are due simply to the differences in the relative acidities of these liquids.

In a second series of experiments with a different sample of papain, the following figures were obtained :—

Strength of Acid.	Percentage Undigested. Tartaric Acid.	Boric Acid.	Hydrochloric Acid.
0·1 per cent.	73·3	74·7	78·2
0·25 „ „	71·7	73·3	34·2
0·5 „ „	65·4	71·6	11·8

The same papain with distilled water, under the same conditions, left 78·0 per cent. undigested. It is therefore evident that 0·1 per cent. of any of these acids has little influence on the amount of digestion.

(*c*) *Influence of Salt.*—M. Dastre has lately pointed out that the halogen salts in large quantities (sodium chloride, sodium fluoride, and ammonium chloride) induce a digestive change in fresh proteids in the absence of any ferment. In gastric juice the amount present is about 0·4 per cent. With papain an increase in the amount of salt seems to slightly retard solution, thus :—

Percentage Undigested after Three Hours in Presence of—		
0·1 p.c. Na Cl sol.	0·25 p.c.	0·5 p.c.
52·2 „	54·3 „	60·8 „

I have also tested the behaviour of formaldehyde, which, under the name of formalin, is being introduced as a preservative, and is therefore likely to be present in food stuffs required to be digested. According to Loew (*J. Prak. Chem.* [2], xxxvii. 101), formaldehyde at 40° renders diastase inactive. With papain it has an arresting effect, thus :—

Percentage Undigested in Presence of a Solution of Formaldehyde.		
0·01 p.c.	0·1 p.c.	1·0 p.c.
65·9 „	78·8 „	88·1 „

Papain can therefore be used as a digestive ferment in acid, alkaline and neutral solutions. Its activity is diminished at temperatures above 40° C., and is most pronounced in the presence of small quantities of liquid. No appreciable advantage is gained by using a larger amount than 1 per cent. by weight of the proteid in its natural state. Its activity is most pronounced in the presence of a hydrochloric acid solution of about 5 per cent. strength, whilst

for alkaline digestion a 5 per cent. solution of sodium bicarbonate gives the most satisfactory results. After from three to four hours the rate of digestion becomes very slow, so that for practical purposes this length of time is to be recommended.

In a set of experiments, using 15 grammes of coagulated egg albumin—equivalent to 2·267 grammes of dry albumin, and containing ·340 gramme of nitrogen—the amount of nitrogen rendered soluble in three hours by 0·15 gramme papain in the presence of (1) 45 c.c. of 0·5 per cent. hydrochloric acid, (2) 45 c.c. of 0·5 per cent. sodium bicarbonate solution, and (3) 45 c.c. of water, were as follows:—

	HCl.	$NaHCO_3$	Water.
Wt. nitrogen in grammes	0·193	0·121	0·0998
Percentage of soluble nitrogen . . .	57·0	35·6	29 3

It seemed of interest to compare the action of pepsin with that of papain under the conditions which are favourable to the action of papain, viz., in the presence of a small amount of liquid. For this purpose two samples of pepsin were employed, and the amount of digested minced meat fibrin and egg albumin both determined. The following results were obtained:—

1. Meat fibrin quantities. Weight digested.

Meat fibrin	10 grains.
Ferment	0·1 grain.
Distilled water	30 c.c.
Time	30 minutes.
Temperature	38° C.

	Pepsin, P.D.	Pepsin, H.S.	Papain, S.I.
A.	12·18 per cent.	11 82	15·34
B.	20·9 „	17·2	11·1

2. Egg albumin. Weight digested.
Conditions the same with constant shaking.

	Pepsin, P.P.	Pepsin, H.S.	Papain, S I.
A.	20·16	20·94	20·42
B.	14·0	14·7	14·5

Under these conditions the papain gave the best results with meat fibrin, whilst with egg albumin the amount of digestion was intermediate between that given by the two pepsins examined.

From an examination of the products of digestion in one experi-

ment in which the total nitrogen digested amounted to 0·105 gramme, I found it distributed as follows :—

Coagulable albumin	0·0258
Albumoses	0·0268
Peptone	0·0528
	0·1049

The PRESIDENT said this paper would no doubt prove of great value. Personally he had no experience of the digestive action of papain.

Mr. REYNOLDS said, although he could quite understand the author was not likely to introduce clinical matter into the paper itself, he would recognise that pharmacists felt considerable interest in the application of remedies, and that pharmacy was only a means to an end. Papain had been recommended as a solvent for the diphtheritic membrane, and it would be interesting to know if that was likely to prove correct.

Mr. UMNEY said it was unfortunate that two noted pharmacists who had worked on the subject, Mr. Benger and Mr. Dott, were not present. There had been many conflicting statements with regard to papain, and if he remembered aright, Mr. Dott said that papain had only a slight solvent action at the temperature of the body, and practically no peptonising power. He should be glad to know if Dr. Rideal confirmed this or disagreed with him.

The PRESIDENT said one point which must strike every one as very remarkable with regard to these ferments was the small percentage which appeared to be active, and the great activity it possessed. When they had a preparation of pepsin of 1 in 100 it was thought to be active, but now they had 1 in 4000 which was active, it suggested itself to him whether there might not be something similar in the action of these unorganised ferments to what was known as catalysis in chemistry, where a small amount of one body, not altered in itself, practically acted as a carrier and altered the substances which it attacked. There were evidently a number of problems suggested by this paper.

Dr. RIDEAL said he was not a medical man, and therefore could not deal with the question put by Mr. Reynolds. With regard to Mr. Umney's question as to the discrepancy between Mr. Dott's work and this, it depended entirely on the conditions. Most previous investigators, as far as he could learn, were told that papain was something like pepsin, and followed the pepsin directions.

They got results which were contrary to the results shown in this paper; but if they followed the conditions he laid down, they would get good results. The conditions were altogether different from those of pepsin. The chief of those was the quantity of fluid. Keeping the fluid down, you got good results with papain; but if you had present a large quantity of fluid, pepsin was the best and papain the worst.

A vote of thanks was accorded to Dr. Rideal for his paper.

The Conference here adjourned for luncheon. On resuming, the following note was read:—

NOTE ON COCO-NUT STEARIN AS A BASIS FOR SUPPOSITORIES.

By C. J. S. Thompson.

Some years ago several experiments were made with a view to utilising coco-nut stearin as a basis for suppositories and pessaries, but lack of time prevented their completion. The matter had slipped my memory till recently, when a sample of the base was discovered, prepared at that time and still in excellent condition.

The suggestion is by no means a new one, as Brady, in a paper read before the Pharmaceutical Society in 1866 on "Medicated Pessaries and Suppositories," drew attention to the fact that a satisfactory base for suppositories could be prepared from coco-nut stearin.

For this purpose he recommended the following formula:—

Coco-nut stearin	9 ozs.
Lard	1 oz.
Oil of pimento	20 minims.

The essential oil was added to prevent rancidity, and the lard as a tempering medium. This base, the author states, "will keep unchanged for any reasonable length of time, and leaves little to be desired."

From my own experience with the base it was found much too soft, as it melts at 82° F., and the product when set will scarcely bear handling.

The coco-nut oil of commerce, with which you are all familiar, is the fixed oil of the *Cocos nucifera*, usually obtained by expression.

When pure it should be of a fine white colour, about the con-

sistence of lard at ordinary temperatures, becoming solid at 40° or 50° F., and having a melting-point of about 80° F.

It has a bland taste, and its pleasant characteristic odour is well known.

Most authorities now agree that it mainly consists of a peculiar fatty principle called cocinin, with small amounts of olein.

Cocinin when saponified with alkalies yields glycerin and cocostearic acid, the formula being given as $C_{13}H_{26}O_2$. According to Allen, the main constituent is the glyceride of lauric acid, $C_{12}H_{24}O_2$, and the glycerides of myristic, palmitic, and stearic acids are also present in notable quantities. It is readily soluble in alcohol, and has been also found to contain caproic, caprylic, capric, and other volatile acids. Its tendency to become rancid is small, and on account of its ready absorption when rubbed on the surface of the body it is largely used in Germany as an ointment base, and in this country in the massage treatment.

It is further claimed to be less liable to produce chemical changes in the substances with which it is associated than lard, and also preserves them better than the animal fat.

The "United States Dispensatory" states the ointment of iodide of potassium, when made with lard, becomes yellow in a few days, while if made with coco-nut oil remains unchanged for two months or more.

The melting-point of coco-nut stearin being low, in order to form a satisfactory base for suppositories, the addition of some more solid body is necessary, and for this purpose after experimenting with several substances I have found white wax answer the purpose best.

The following formula gives a satisfactory result:—

Coco-nut stearin	4 ozs.
White wax	340 grs.

Melt together with gentle heat over a water-bath.

The product is of a firm and fairly hard consistence, with a melting-point of about 98° F., becoming solid at 64° F., and will be found admirably adapted for a suppository base. The melting-point, if considered too high, may easily be lowered by using less wax. It mixes well with vegetable extracts, does not go soft on keeping, does not become rancid when in contact with metallic salts, and cools more rapidly than cacao butter.

Cacao butter is now so generally used, and so admirably answers the purpose of a suppository base in almost every respect, that it

is a difficult matter to suggest a rival or a body more suitable.

From a pharmaceutical point of view, I have found the coco-nut stearin base answer equally well. It has the further advantage of being cheaper, and can be made at a third the cost of cacao butter. It cools very rapidly, and at ordinary temperatures is set and ready to be taken from the mould in about ten minutes.

Suppositories have been prepared with this base from all the B.P. formula, also with belladonna, hamamelin, carbolic acid, boric acid, and many combinations, and in each case it has proved most satisfactory.

Two medical practitioners, who kindly undertook experiments with both suppositories and pessaries prepared with the proposed base, report as follows:—

"The result has in each case been satisfactory and rapid, showing that they have been readily absorbed. As regards the suppositories themselves, they appear to be excellent, and have a very good appearance."

The PRESIDENT said he was very sorry the author was not present. He supposed the justification for this paper was to be found in a paragraph in the last edition of Squire's "Companion to the Pharmacopœia," where it was stated that coco-nut stearin was, as a basis, better suited for suppositories in cold weather. As already mentioned, Mr. Brady, in 1865 and 1866, made a number of experiments, and he quoted the formula Mr. Brady said might be used. Since that cacao butter had been used, and was absolutely unobjectionable, and he had yet to learn that the internal temperature of the body varied in summer and winter. He had tried an experiment since the paper was put on the list, and found, after surrounding cacao butter suppositories with ice for twenty-four hours, that the time during which they would melt in water of the temperature of the human body was not materially altered, even by the fraction of a second, from those made in the ordinary way. The possibility was that the oxidation of the surface of the cacao butter, which went on by keeping suppositories, might retard to a slight extent the time during which they would melt. But cacao was simply an ideal basis for suppositories, and absolutely fulfilled all the conditions. It did not become rancid. It did not change by keeping, and it could be handled at practically any temperature of the English climate, and introduced

safely. Stearin suppositories, if made, must be made to suit the temperature, which would vary between winter and summer, and the nurse who had in June to use stearin suppositories made in January would find the mere handling of them would render them too soft to be used properly. To introduce a suppository required a little pressure; you must have sufficient firmness, but when *in situ*, it dissolved at the temperature of the body, which was practically the same, summer or winter. Since the publication of Mr. Brady's papers in 1866, the only change that had been suggested was that in sending suppositories to India, where morphine suppositories were of great value for dysentery, a little wax was added to raise the temperature at which they would soften. Something was said about cheapness. He was certainly in favour of economy —avoiding waste—but cheapness had nothing whatever to do with pharmacy. Who would go into the fractions of decimals that would show the difference between twelve stearin suppositories and twelve made with cacao butter? It was absolutely ridiculous. This reference to economy occurred in three or four papers, but it was absolutely beside the question. Cacao butter answered every requisite. Mr. Brady showed that at that time the German was better than the French, and the French better than the English, but since then English cacao butter could he obtained by the ton at a few pence per pound, absolutely pure. As he had said, the paper might be justified by the paragraph in Squire's book, but he was sorry to see any suggestion that the basis in the B.P. should be altered. That morning there was a question about stearic acid being cheaper than oleic acid, but you could not get any definite body called stearic acid, though you could get cacao butter, which was practically always alike, and did not vary materially in its melting-point, and would keep practically for ever.

Mr. GERRARD said up to the present time there had never yet been presented a suppository base that was equal to cacao butter. On one point, perhaps, he might differ from the President, who said that cacao butter did not become rancid. His experience was that it did become rancid, and lost its yellow colour, which was evidence of it. A piece of cacao butter placed in a glass bottle, as was often done in museums, and exposed to light and air, would give evidence of rancidity in the course of two or three months, the colour being changed from yellow to white. It would be very strange if a natural fat did not become rancid. It was true that as compared with other fats it was not so prone to rancidity and was not offensive. About twelve months ago his attention was

called to this coco-nut stearin whilst going over the factory of a large confectioner. He told him it was called coco butter, and was sold under that name. It was a beautiful yellow butter, exactly like the ordinary cacao butter, very different from the sample now produced, and had an aromatic odour. His friend said it was used for mixing with certain confectionery, to impart to it a slightly greasy character to prevent it adhering to the mould. He gave him four or five pounds to experiment with, and after testing its qualities he came to the same conclusion as the President, that this coco-nut stearin was not equal to cacao butter as a suppository base.

Mr. MARTINDALE agreed with the President that theobroma was an ideal substance for suppositories. The sample of stearin sent round was very nice, but the disagreeable odour it assumed when it became rancid made it very objectionable. Theobroma, if it even did become slightly rancid, was never disagreeable.

Mr. UMNEY said his experience was not quite so great as that of the President or Mr. Gerrard, but he quite agreed with the last speaker that in cacao butter they had a thoroughly sound basis for suppositories. Time was when that substance could not be obtained in a pure condition, but public taste had advanced since then, and now the united makers of cocoa without fat sent on to the London drug market a constantly increasing quantity of genuine cacao butter in a natural condition, and it was also largely supplied bleached. Every two or three months a quantity such as 100 tons would be offered by public auction. As the President had said, a substance could be obtained which varied only within a few degrees of melting-point, and his own impression was that there ought not to be a greater difference allowed. Unfortunately, the Pharmacopœia gave a larger latitude, and he feared that rather encouraged sophistication. He thought one degree on either side of the exact melting-point of pure cacao butter would be quite sufficient.

Mr. MARTINDALE said the great point was to be sure it was dehydrated.

The PRESIDENT said cacao butter could be got in any quantity, and apparently a great deal of it was sophisticated, but in twenty years' experience he never found any difficulty in getting any quantity of it at a moderate price which would melt at a difference of between one and two degrees. Of course it would oxidise, but did not become rancid in the sense that stearin would—in the sense of producing irritating acids which would make it inapplic-

able in the case of a sensitive rectum. It became rancid probably in a purely chemical sense, but after the suppository had been made for twelve months or two years, it was quite safe to use. If one could find a basis which was superior, by all means substitute it; but if not, there was no reason for dissatisfaction.

Mr. Thompson was thanked for his paper.

The next communication was the following:—

NOTE ON PHOSPHORUS PILLS.

By R. H. Parker, F.C.S.

Phosphorus pill-mass prepared with a fatty or resinous basis, beside being troublesome to prepare, difficult to preserve, and in some cases impossible to digest, is often found inconvenient at the dispensing counter on account of its bulky character and its disposition to produce crumbly masses when combined with other ingredients. Pills freshly prepared with a solution of phosphorus in carbon bisulphide diffused through liquorice powder are not open to these objections; it seemed, however, desirable to determine whether such pills are permanent, and contain the full amount of unoxidised phosphorus.

I will first describe in detail the exact method adopted in preparing, for example, two dozen pills.

Take of—

Phosphorus, the prescribed quantity for	24 pills.
Carbon bisulphide	30 minims.
Liquorice root, in powder . . .	24 grains.
Glycerin	4 minims.
Tragacanth gum, in powder . .	2 grains.
Syrup, a sufficient quantity.	

Dissolve the phosphorus in the bisulphide, pour the solution upon the liquorice powder in a pill-mortar, stir uniformly within the smallest possible space, by means of a spatula, until the solvent is nearly evaporated (no portion should be allowed to assume an appearance of dryness); as soon as the mixture becomes nearly solid, and while still moist with bisulphide, add a sufficient quantity of syrup to form a soft pill-mass, and incorporate quickly until homogeneous. Any other prescribed ingredients may now be added *secundem artem*, and the mass divided into twenty-four pills without undue exposure; no coating is necessary.

Not finding a recorded method for the determination of free

phosphorus in pills, I decided to try extraction with carbon bisulphide, oxidation to phosphoric acid, and final titration with standardised uranium solution. This method gave very fair results. A solution of uranium acetate was prepared and titrated against sodic phosphate; its value was found to be 1 c.c. = 0·002298 phosphorus.

Experiment 1.—0·2 gramme phosphorus was oxidised with nitric acid in presence of a fragment of iodine, evaporated until nitrous fumes ceased to be evolved, diluted with water, slight excess of sodium bicarbonate added, then acidified with acetic acid and made up to 229 c.c. with water; of this solution 40 c.c. = 15·1 c.c. uranium solution, *i.e.*, 0·1986 phosphorus found.

Experiment 2.—0·0472 gramme phosphorus was dissolved in carbon bisulphide, evaporated to dryness, the residue oxidised, and an acetic solution prepared as in experiment 1, diluted with water to 50 c.c. Of this solution 20 c.c. = 8·1 uranium solution; *i.e.*, 0·0465 phosphorus found.

Experiment 3.—0·4 gramme phosphorus in 2 c.c. carbon bisulphide poured on 6 grammes of liquorice root powder and made into 100 pills, in the manner described in the early part of this note. Ten of these pills were kneaded in a glass mortar with several successive quantities of carbon bisulphide, the mixed solutions evaporated to dryness, the residue oxidised, an acetic solution prepared as before and made up to 50 c.c. with water. Of this solution 20 c.c. = 6·7 c.c. uranium solution; *i.e.*, 0·0385 phosphorus found. The remainder of these pills, examined in a similar manner at intervals of three months, showed practically no diminution of phosphorus. A sample of pills is on the table prepared as already described, each containing $\frac{1}{100}$ of a grain of phosphorus, and without any kind of coating; they have been kept in an ordinary pill box, occasionally opened and the pills handled since January, 1889—a period of nearly six years. They evidently contain the phosphorus exactly as when first made, for the slightest superficial scratch still produces phosphorescence, and a central section exhibits the same phenomenon over the entire surface. These pills rapidly disintegrate even in cold water, and without the assistance of massage.

The conclusions are obvious—that phosphorus pills may be easily prepared by this method without material loss or oxidation, that they are permanent, and that no coating is necessary for their preservation.

Mr. INCE said he was quite sure they might congratulate the author on his mode of making phosphorus pills; there were very many formulæ at present for this particular preparation, and as far as he was concerned, he thought nothing ought to be attempted with phosphorus or similar substances unless you could effect entire solution. It ought not to be allowed to enter into combination, except in a state of solution. He entirely agreed with what had been said about the comminution rather than solution of phosphorus by oil or fat; they got it finally comminuted, but no more, and he thought that was more or less dangerous. Officially they were bound to follow the instructions of the B.P., and, following it with great care and attention to temperature, they got a fairly good result; but he objected to that formula altogether, because the phosphorus was not combined in a perfect state of solution.

Mr. MARTINDALE said after all was it not a form of comminution in the method followed by the author, who got the phosphorus in solution in bisulphide, and then precipitated in the pill. He had paid a great deal of attention to this subject for the last twenty-five years, and he must say he preferred to keep the phosphorus in solution always. The formula which he published some twenty years ago was that of dissolving it in cacao butter. A one per cent. solution could be made in that substance which could be easily rolled out into pills, and if they were fairly freshly prepared, the phosphorus was in the most active condition in which it could be administered, and in that condition was easily digested. The phosphorus Mr. Parker mentioned was only in a precipitated condition. It melted at 110° above the temperature of the body, and in that way could hardly become completely digested when swallowed, and therefore he hardly thought the full dose of phosphorus would act. It was true they often had to combine phosphorus with other ingredients, and other processes of dissolving it in bisulphide and adding the other substances might be convenient. Mr. Groves suggested about a year ago a mode of emulsifying phosphorus to the finest condition by following Mr. Parker's process to this extent—dissolving in bisulphide, adding that to yolk of egg, stirring quickly, and adding a little chloroform to prevent oxidation. The emulsification of the bisulphide solution with yolk of egg was quick and complete, and on afterwards adding some liquorice powder you produced a mass which Mr. Groves suggested an ingenious way of keeping. He smeared the stopper round with honey, and put a little cotton wool inside, with a few drops of ether. This mode of preserving phosphorus

pill-mass might be used for any mass containing phosphorus, but phosphorus pills would not keep for any length of time. He had some made on the 14th of April last year, and they were now completely oxidised; there was no glow of phosphorus about them, although they were varnished. He held that phosphorus pills should be freshly made. As to nostrum-mongers making these pills a speciality, it was an absurdity. Phosphorus should be dispensed as quickly as possible, and not kept in stock.

Mr. GERRARD said that at the time when phosphorus was first introduced he remembered very well the trouble he had to get preparations of it in a satisfactory condition. He suggested common resin as a solvent, but that was improved upon by Mr. Abrahams, of Liverpool, who suggested balsam of tolu. That suggestion was taken up by the pharmaceutical authorities, and the method introduced as the basis of the official pill. Since that time there had been considerable improvement made, and Mr. Martindale himself had done excellent work in that direction. If Mr. Parker had looked up the *Year-Book of Pharmacy*, he would have found that in 1878 it gave a process which was quite on parallel lines with the one now brought forward. He suggested then that they should be made by dissolving the phosphorus in bisulphide of carbon, pouring this over the compound tragacanth powder, moistening it, adding a little chloroform to prevent oxidation, and rolling the mass out quickly.

Mr. HARDWICK said the point of this paper was not the way of making phosphorus pills, but a statement that they would keep for a long time without oxidation. Mr. Parker thoroughly condemned all kinds of fatty bases for phosphorus pills. Now they often had to dispense phosphorus pills with a number of other ingredients, such as nux vomica, cannabis indica, quinine, or even strychnine, and often in practice a very useful manner of obviating the difficulty of weighing out minute quantities of phosphorus, such as half a grain, or less, was one the suggestion of which he got from an early edition of Mr. Martindale's book. He dissolved the phosphorus in bisulphide, and added a fatty base, the most convenient being suet, with a small addition of vaselin and kaolin to make it sink in water. Then he kept the composition under water, as he kept stick phosphorus, and taking out small portions and blotting off the moisture, he was able to weigh it without difficulty, and make up pills easily, which rolled well and kept their shape.

Mr. WILLIAMS said he was particularly interested in Mr.

Parker's paper, because it was contrary to all recent opinion as to the stability of phosphorus in pills. They were always taught that it certainly did oxidise, and he was astounded to hear that a preparation had been kept six years and still exhibited phosphorescence. A short time ago he saw that amorphous phosphorus had been highly recommended as producing exactly the same result as ordinary phosphorus, but he had not been able to confirm the statement by any one who had had experience of its use; but it seemed to him the advantages were considerable, provided its medicinal value was equal to that of ordinary phosphorus.

Mr. GURNEY said he remembered some years ago dispensing a prescription containing 2 grs. of amorphous phosphorus in each pill. He at first thought the dose must be excessive, and consulted the medical man, but he said it was all right; 2 grs. of amorphous phosphorus was a perfectly safe dose, and would have no more effect than one-thirtieth or one-fortieth of a grain of the ordinary crystalline form. The prescription was dispensed several times during a week or two, and he never heard anything more about it.

The PRESIDENT said he did not wish to stop discussion, but every one would agree with his own experience that his natural life was not long enough to indulge in perpetually going back to the rudiments. Allen and Hanburys in the *Pharm. Journ.* for May, 1876, published a formula for phosphorus pills by solution in bisulphide of carbon, and mixing with soap, guaiacum, and liquorice, which left nothing to be desired. Essentially this form was the same as Mr. Gerrard's, except that there was soap and guaiacum in it. It had been reproduced in the "Art of Dispensing," and was one by which twelve, twenty, or a million pills could be made, and it had been used by thousands of pharmacists, who were content to take a thing of this sort and save themselves the trouble of needlessly trying experiments over and over again. That pills should keep for ever was not expected, or that pills made on the other side of the Atlantic should be taken on this side was ridiculous. At the same time, they did not want to make every preparation day by day. He had made pills according to this formula, combined with other ingredients, and they were practically unalterable for a long period. It so happened that this formula, in combination with other ingredients, was on the shelves constantly, and when he saw this note was to be read he told his assistant to get a bottle of the oldest phosphorus pills

he could find, to examine them, and to see whether they were soluble and contained unaltered phosphorus or not. He gave him a report to the effect that they were as soluble as pills could be, dissolved at the temperature of the stomach in a few minutes, and contained practically unaltered phosphorus. When they had a formula which was practically so satisfactory as this, it was not desirable to spend their time in endlessly studying rudiments when there were great chemical problems in front of them, and more important things to be studied.

Mr. PARKER said that Mr. Martindale's formula of phosphorus dissolved in theobroma was no doubt very satisfactory if you could roll out the pill-mass uncombined with other ingredients. But he found the formula now suggested gave a mass that could be mixed with almost every ingredient that came to the dispensing counter. Phosphorus should be administered in solution probably, but in this case he took 24 grs. of liquorice powder, dissolved the phosphorus in 30 minims of fluid, and made a sort of mud of it, and by that means every cell of the liquorice powder was equally permeated by phosphorus. The pill, when finished, dissolved readily in cold water, and if introduced into the stomach disintegrated directly into an enormous number of minute particles of phosphorus. Whether that was different in physiological action to phosphorus dissolved in theobroma he could not say. He must disclaim any idea of novelty in the formula. He did not claim that in the paper. Mr. Lloyd Williams had referred to the value of amorphous phosphorus. He had repeatedly dispensed large quantities of it, and it was stated by many authorities that it was inert. Certainly very large doses of it had been given, and if quite free from any other form of phosphorus it probably was inert. Particular attention must be given to see that it contained nothing but amorphous phosphorus. The President complained of his returning to rudiments, but he would not have taken the trouble to investigate whether these pills, after being kept for six years, were as good as when they were made, if he had found any record of that fact. He could not find any statement as to the keeping properties of pills made in this way, or whether, after a week, they would contain free phosphorus or not. He simply conducted this work for his own satisfaction, and recorded the results to save other people from going through the rudiments.

Mr. Parker was thanked for his note.

The following paper was next read:—

THE NOMENCLATURE OF OFFICIAL REMEDIES.

By Joseph Ince, F.L.S.

In view of the advent of an Imperial Pharmacopœia, I venture to say a few words upon this subject. There is always a fear when the word nomenclature is mentioned lest some fanciful theory should be introduced, ingenious possibly, but of little practical use.

I have no speculative suggestions to advance, and all I ask is that as new official remedies claim adoption to which latinised names must of necessity be given, the construction of this nomenclature should follow the ordinary rules of declension which are commonly known and accepted. We have already in the body of the Pharmacopœia several words which have been left as indeclinable, while the Addendum is in evidence that their number is on the increase—a matter which reflects on the scholarship of the day, and embarrasses the prescriber, who, owing to the technical arrangement of a prescription, has to frame a terminology with declensions of his own.

I would leave untouched the whole series of undeclined words which do not naturally admit of classification in order to avoid any manner of innovation. Such are:—Elemi, as in unguentum elemi; gummi, as in acaciæ gummi and eucalypti gummi; buchu, as in buchu folia, infusum buchu, and tinctura buchu; catechu, as in infusum catechu, pulvis catechu compositus, tinctura catechu, and trochisci catechu; this last is correctly made neuter and called catechu pallidum.

Tolu cannot be included, for it has no representative Latin noun, being used as an adjective throughout. Thus we get syrupus tolutanus, tinctura tolutana, and balsamum tolutanum.

But when we turn to latinised terms which obviously belong to certain definite declensions, it is a reasonable request to make that they should not continue to be inserted in a standard work without reference to the common rules of construction. On the threshold is liquor gutta-percha (perhaps an oversight). The U.S.P., recollecting mensa, æ, gives liquor gutta-perchæ.

It has long been an accepted rule, with regard to which there has been an entire consensus of opinion, that neutral principles should be made to end in *inum*, and that the English equivalent

should end in *in*; while alkaloidal principles should be made to end in *ina*, for which the English equivalent should be *ine*.

This excellent arrangement has proved a great gain to the chemist, the physician, and the student, for it is a nomenclature which conveys definite information. One sees, therefore, with regret, certain deviations which have crept in unawares.

Aloin, correctly anglicised aloin, is as much entitled to be aloinum, as benzoinum, *anglice* benzoin.

Pyroxylin, the type of an *inum* word, is probably a misprint for pyroxylinum, but for pepsin no such allowance can be made; it should be pepsinum (not pepsina, alkaloidal form), and would cease to be an anomaly.

In no spirit of fault-finding is the further remark that equal care should be taken in rendering the English equivalent of these words uniform. If we say, on principle, ergotin, paraffin, and the like, because the Latin form is ergotinum and paraffinum, we are scarcely at liberty to write gelatine from gelatinum and glycerine from glycerinum. These are commercial terms, but they somewhat confuse a student who has had plain rules laid down for his guidance, and no objection would be taken by the trade to find them accurately named in an official standard book.

It has long seemed to me desirable that three common forms of declension should be followed in cases where they may be required.

1. Neuter nouns ending in *al*. (Third declension.) Example. Animal, animālis.
2. Neuter nouns ending in *ol*. (Third declension.) Example. Alcohol, alcohŏlis.
3. Masculine nouns ending in *o*. (Third declension.) Example. Sapo, saponis.

Other nouns at present taken as indeclinable, as amyl and sumbul, are open to discussion, and with respect to such, differences of opinion would exist.

I should like to see the title syrupus chloral banished from the Pharmacopœia, as it has long been from the prescription of the practitioner, and let it enter into uniformity as syrupus chloralis. Sulphonal (in the Addendum) enters as yet into no other preparation, but should that happen, its inflexion would be already determined. Meanwhile, the prescriber writes sulphonalis grana quindecim when he would indicate the dose.

If we say, as we certainly do, guided by the Pharmacologia—

℞ Camphoræ (Alcohole solutæ) ʒi.

or

℞ Camphoræ (alcoholis ope in pulv. redact) gr. viii.,

surely the title emplastrum menthol should no longer be retained, but give place to emplastrum mentholis, and thymol, with all companion words, would follow suit.

Former editors have foreseen the difficulty which occurs in matico and pimento, and have latinised both as infusum maticæ and aqua pimentæ. Let them stand, especially the latter, which comes from pimenta; but it seems advisable, in anticipation of the future, that other or new terms which may resemble sapo should have the same declension, while kino and cusso might obey the same rule. If we say linimentum saponis and cataplasma carbonis, why say tinctura kino and infusum cusso?

In conclusion, let me express the hope that the above remarks may not be considered in the light of a mere literary excursus.

The class of words to which attention has been directed must grow and multiply, and then the full inconvenience of a heap of undeclined pharmacopœial titles will be felt.

I advocate no novelty in nomenclature, but only recommend the systematic adoption of known grammar rules to meet new requirements.

The PRESIDENT said in view of the possibility of a new Pharmacopœia being proceeded with at an early date, this was a subject which would probably provoke some amount of discussion.

Mr. MARTINDALE asked what objection Mr. Ince had to indeclinable words such as thymol, menthol, and sulphonal. The custom had been that when a noun was taken from one language into another, as when Greek terms and Arabic terms were introduced into Latin, they were introduced indeclinably, and he thought that should be the rule, and with such words as thymol, sulphonal, chloral, amyl, and others it was best to make them indeclinable. What object was there in making them declinable? They could understand from the context of the prescription what the meaning was. When they saw amyl nitris they knew it was in the genitive, and the same with chloral hydras, that it was hydrate of chloral. It was plain to all that the chloral in that case was genitive. One of the scholars who compiled the first British Pharmacopœia was very strong on that point. He held that they should render chloral indeclinable, and not make it chloralis hydras. With regard to the incongruity of the terms

gelatin and glycerin being put into the latinised terms, they followed the common commercial rules, in spite of what had been accepted as the scientific termination of those two words. Glycerin was spelt in Watts's "Dictionary" without the final "e," and it was so consistently in scientific work, but the common commercial rule was to give the final "e." If the "e" were dropped, it would look as if it were something else.

Mr. ATKINS said, assembled as they were in a great classic institution where, of all places, Greek and Latin would be most strictly and authoritatively defined, he would venture as a practical principle to express the thought, which was in harmony with Mr. Ince's opinions, that there ought not to be anything such as was called in his early days "dog Latin" in pharmacy. Their Latin ought to be up to date, and the Latin of the Pharmacopœia and that of the apprentice should be as far as possible strictly in harmony with their classical instincts.

The PRESIDENT said he could only assume, seeing so few joined in the discussion, that they would all sit at the feet of Mr. Ince on a classical subject. He hoped the future Pharmacopœia authorities would do so, and listen to what he had to say. He could quite understand that when a man coined terms it was exceedingly inconvenient that those terms should be submitted to classical authorities and subjected to classical rules, because if they looked at the advertising pages of the press it would be seen that they often went to Southampton Buildings and registered a term and obtained a proprietary right in it, and it would be exceedingly inconvenient if those words had to submit to classical laws. Any one who had any regard for scientific nomenclature must deplore the way in which words came into use. What was meant by such words as "dermatol"? In their early days they examined students in Latin; they did not do so to teach them dog Latin, but that they should be able to correctly translate a prescription written in Latin. He hoped that this short paper would have considerable effect, and that the Pharmacopœia authorities would not only make the new edition worthy of England and of the nineteenth century in the formulæ selected, but also in the names, and in the manner in which they were used. He would not criticise the United States Pharmacopœia in this respect, because America was a law to itself; it observed all that was convenient, and nothing more; but with regard to setting the fashion for the use of the English or Latin languages, they need not go across the Atlantic.

Mr. INCE, in answer to Mr. Martindale, said he could not see the advantage of wandering about utterly adrift, without rule and guide in the great number of new preparations which must of necessity be introduced. In order to keep these within the bounds of common sense, and not what was called classicality, he had taken special pains to cut down the paper to one-third of what it might have been, and to confine his remarks to suggestions which he thought were of use and might be adopted. That was why he advocated introducing some plain, definite rule, known to everybody who had passed the fourth form, by which a word with a certain termination, and that belonged to an ordinary thing and not to a novelty, should follow the ordinary rule for its declension. If you had a word introduced into the Imperial Pharmacopœia with that termination, why on earth should it be left indeclinable? Those who came afterwards would think it was owing not to any theory, but rather to a want of acquaintance with the subject. He had very carefully limited his suggestion to the three plain ordinary declensions. When you had words with those ordinary terminations, why should they all run adrift? Those who prescribed had by necessity to employ a certain definite mode of conveying their ideas, which was called a prescription; they could not help themselves. They had to put all their quantities in figures, which had to be translated properly by candidates for examination. They had to know the correct Latin for those figures and the case, but the ingredient which formed the prescription itself had from necessity to be put in a certain case, the genitive. The result was the medical profession went far in advance of what the rule of construction laid down. They took these words in "al" and made them "alis," but that was nothing arbitrary. He wanted to get out of any notion of his own, or any arbitrary formation. All he asked for was that ordinary grammatical rules might be followed. Mr. Martindale asked what was really the object, because they could guess by the context at what was meant. But they did not allow the students to pass in that way. They took care when they had a prescription before them that they should be able to translate it correctly, and not only to understand the meaning, and why they should require from students that which they did not require from the official Pharmacopœia he could not understand.

A vote of thanks was accorded to Mr. Ince for his paper.

The next paper read was on—

ENGLISH MEDICINAL RHUBARB AND HENBANE.

By Richard Usher.

Rhubarb.—Although the introduction of medicinal rhubarb into England is dated by Parkinson as far back as 1629, no real experiments in its culture and preparation for medical use appear to have been made till 1762, when a quantity of seed was sent from Russia by Dr. Mounsey, from which period till about 1800 it was successfully grown in small quantities by many scientific men, after which it was cultivated at Banbury on an increasing scale, and is now known in the commercial world as a general article of trade, and not only is it consumed in considerable quantities in this country, but is exported largely to various parts of the civilised world. The origin of the plantations of rhubarb in my possession, and now extending over forty acres, will be best traced by the following extracts from the "Transactions of the Society of Arts." In 1789:—"The Society, in consideration of his merit, and to promote as much as in them lies the growth and cultivation of so valuable a drug, voted their silver medal to Mr. Hayward as a bounty." In 1794:—"The following accounts and certificates respecting the growth and cure of rhubarb have been received, the gold medal being the premium offered for cultivating the greatest number of plants, was adjudged to Mr. William Hayward, of Banbury." The following is the testimony of Dr. Pereira:—In 1789 Dr. Hayward obtained a silver medal, and in 1794 a gold medal from the "Society of Arts" for the cultivation of English rhubarb. Dr. Hayward died in 1811, and the plants were purchased by my late grandfather, Mr. P. Usher.

As a proof that even at this early period of its cultivation English rhubarb had obtained the confidence of scientific men, it may be stated that in 1798 rhubarb of British growth was used at St. Bartholomew's, St. Thomas's and Guy's Hospitals, and was being experimented on at several others. According to the testimony of Sir Alexander Dick and Dr. Hope, of Edinburgh, in 1784, but little rhubarb was used by the apothecaries of that city, except that which was produced in Scotland, and it was considered in no respect inferior to Russian. About the same time English rhubarb was put to a severe test at Bath by Drs. Falconer, Parry, and Fothergill, all of whom attested its merits. Dr. Falconer remarked that two of the specimens submitted to them answered

in external marks to the character of the foreign; that they were rather inferior in delicacy of taste to the Turkey, but superior in other respects to the East India. In 1810 Dr. Thornton, then lecturer on botany at Guy's Hospital, referring to the encouragement given to the cultivators by the Society of Arts, makes these remarks: "This account may serve to show both the ardour of this respectable Society in encouraging the growth of this useful article and the persevering industry of some gentlemen in overcoming all the difficulties attendant on introducing a new plant into cultivation, finding out the means of curing it as an article for extensive sale, and overcoming the prejudices of such as cannot persuade themselves that a drug of British growth can bear competition with what is sent us from foreign countries."

If at a later date the prejudice against English rhubarb increased, there must have been other causes than those existing on the first introduction of the plant. One cause of the subsequent change in public opinion may have arisen from the partial introduction of new varieties of the plant. From the earliest period in its history there appears to have been a confusedness in the evidence as to its real character, and whether foreign rhubarb was produced from the *Rheum palmatum* or the *Rheum undulatum* remained for many years an unsettled question. At the present day, however, in addition to these varieties, we have a further supply afforded by *Rheum officinale*, derived from the plant introduced into this country, in 1867, by the late Daniel Hanbury as a source of the true Asiatic rhubarb. As far as the question relates to rhubarb grown in Great Britain, the stronger probability is, that, after it was imported, several varieties were produced by repeatedly propagating from seed, when a discrepancy was observed at variance with the earliest descriptions recorded. To show the extent of those changes, I may remark that in the last instance in which I noticed the effect of seedling cultivation, about forty years since, I found the stalks and leaves more than double the size of those produced from offsets, a circumstance sufficient to account for the introduction of such varieties as the Victoria and other large sorts now so common in our gardens, which when propagated from seed still keep working change upon change. So convinced have I been for a long time of the injurious tendency of this system, that I have studiously avoided the use of seed altogether, and the plant has so far receded to its original type that not one has produced ripened seed during the last thirty years. It is a fixed trait in the cultivation of medicinal rhubarb, as it is in most bulbous

plants, that if produced from offsets only it ceases to produce seed, and if raised from seed, each succeeding generation produces seed also, adding variety to variety almost indefinitely. Assuming, as an incontrovertible fact, that the plant has now for such a lengthened period been propagated from offsets as to be incapable of bearing seed, it will guarantee the conclusion that if during a number of years when its cultivation was pursued by a larger number of growers for the purpose of making experiments, and each one in haste to enlarge its growth resorted to seed propagation, it degenerated from external causes, it is equally logical to infer that, the causes having ceased which led to its deterioration, it has now regained its specific distinctiveness, and is not likely to diverge again into any transition from its central type. It is thus quite possible to account for the previous deterioration of the plant for medical uses which caused the strong prejudice existing for many years against it, and the remaining doubts still expressed respecting the real properties of English rhubarb; but that a powerful reaction has taken place in its favour since the plant has been restored to its primitive form of development there is most ample testimony, not only in the increased demand for it at home and abroad, but in the evidence of eminent medical practitioners. In addition to the improvement which became apparent in the plant by the entire exclusion of seedlings, an important change has been effected in the mode of drying by exchanging a high artificial temperature for a more gradual one, the process in the first stages being effected by the application of a strong current of atmospheric air, which has not only greatly condensed the root and rendered it less porous, but has given it an appearance approximating more closely to foreign. The progressive but certain destruction of all former prejudices existing against the use of English rhubarb may be adduced from facts much stronger than theory. The first is that in 1845 the extent of land appropriated to the cultivation of the plant did not reach ten acres; whereas now it has reached upwards of forty acres, and even this is quite insufficient to supply the foreign demand for trimmed English rhubarb. If the home consumption of this drug had remained stationary, the export trade alone would have afforded every facility for extending the plantation, a fact most strikingly shown by the article being sent to ports such as Odessa, from which East India rhubarb is sent to Great Britain. A large proportion of the trimmed rhubarb has for several years been shipped to the American market, where it has become a regular article of commerce.

Henbane.—Through some erroneous impression which has long existed, and still continues, respecting this very important plant, the first year's growth is spoken of as the annual, than which nothing can be more palpably wrong, as the two articles when produced for use vary as essentially in their external appearance as in their constituent properties, applying this simple test only, that the annual plant when dried consists both of leaves and blossoms, whereas the first year's growth of the biennial must necessarily consist of leaves only. Assuming that when the second year's growth of the biennial plant cannot be procured recourse must be had to the first year's growth as a substitute, the Pharmacopœia should have made known the comparative strength of the latter. No objection could have been made to such directions when it could be shown that a second-class article must of necessity supplant a superior one, as occurs doubtless not only in this but in many other medicinal preparations. If in the use of the two separate articles now under consideration the same instructions are carried out, namely, to use two ounces and a half of the dried plant to a pint of tincture, and one should prove to possess two or three times the strength of the other, it assumes a serious aspect in the administration of so important a medicine. We require a new definition altogether of the plant when dried for use. Instead of making two divisions only as at present, annual and biennial, it should be classified as follows:—

Biennial henbane of second year's growth;
Biennial henbane of first year's growth;
British annual henbane;
German henbane.

This would at once simplify the question, and prevent those erroneous views which have very widely prevailed amongst all parties concerned in its preparation and use. It will be seen that I have arranged the above classes in the order of their value. The two last-mentioned, the British annual and the German, although most extensively used, are so thoroughly undeserving notice, that they require mention only to guard the public against their use altogether. Of these two the British annual is perhaps preferable to the foreign, and its appearance, unfortunately, approximates sufficiently close to the second year's growth of the biennial plant to enable the vendor to pass it as such; and if no other criterion existed than that it possesses no flavour or aroma, that would be sufficient to detect the imposture. Independently of this test, the leaves will be found much shorter, and occasionally will be seen a pure primrose-colour blossom, which never

occurs in the beautifully streaked blossom of the biennial; but the very fact of the appearance of blossom in the sample, that blossom being generally so much like the blossom of the biennial, leads to the very erroneous conclusion that it is the same plant.

Owing to the extreme price which the dried biennial plant of the second year's growth has realised in former years, the consumers have not given that encouragement to its production which its intrinsic value merits. The great difficulty, however, which has thus been felt till very recently, that of not being able to obtain a supply except at a most exorbitant price, is now to a great extent obviated. After a long and careful study of the cultivation of the biennial henbane of second year's growth, success has been achieved in preserving the plant from the attacks of insects to which it is ordinarily subject, and by this the loss and temptation to substitute inferior varieties, to which both growers and consumers have been exposed, is prevented.

The PRESIDENT said he ventured to think that this paper, although written by a grower of herbs in the county, was of particular value, and he thought whenever the Conference went anywhere where there was some natural product or herb cultivated which was used in medicine, it would be very useful to have a paper on the subject. He certainly thought Mr. Usher had contributed something of value, both from a historical point of view and also from the practical facts he had recorded as to the cultivation of rhubarb from offsets instead of seeds. If the demand for this English rhubarb only grew, it would be a profitable field for English farmers. Henbane also was a drug of extreme importance, and he had not the least doubt every one present would support him in saying that the uncertain estimation of the value of henbane was doubtless due to the fact that there were several varieties manufactured into tinctures and extracts. The Pharmacopœia clearly defined what henbane should be, but there was strong probability indeed that other varieties did go into medicinal use, and that was one of the causes of the differences of opinion which existed as to the clinical and therapeutic value of henbane and its preparations.

Mr. DRUCE said there was a great deal to be said on the point of general hybridisation. Mr. Usher seemed to have cultivated sometimes one variety of rhubarb and sometimes another, but they were closely allied species, and hybridisation went on. These products were so varying that you never knew what you had got. He might accentuate that by an illustration. Their late lamented

townsman, Dr. Romanes, was making experiments on the hybridisation of animals, and he found that the progeny of the white albino rat and the common brown rat were not piebald as was expected, but simply brown rats, but that the progeny of the second generation of brown rats, the offspring of the white and brown, were piebald. So with hybridised plants, the second generation might come true, but the third might be as variable as possible. M. Nodont, experimenting with stramonium, found he could stamp out the influence of one parent with seven or eight generations of cross fertilisation, but he had not at that time got the stable parents you would have at the first, but instead of that a plant which varied almost infinitely, not in the direction of one of the assumed parents, but in an unexpectedly different way. That might account to some extent for the extreme variability of the rhubarb under culture.

Mr. REYNOLDS said he had rather a special interest in this subject, inasmuch as the rhubarb fields at Banbury were connected with his earliest recollections. Those who indulged in horticulture unquestionably rejoiced in this variability of nature, and the variety which came from the distribution of seeds of plants which were supposed to be nearly the same; but the horticulturist, like Mr. Usher, knew how to produce uniformity by taking cuttings instead of sowing seeds, and therefore it was in their own hands very largely. There were not many medicinal substances which were made the subject of cultivation instead of collection, so large a part of what came to them had been collected from Nature's wild garden; but they were nearly all old enough to recollect when cinchona had a wild origin, when forests were cut down in South America, and how rapidly science provided cultivated cinchona, and what enormous advantages ensued. Within the last few days he received from Mr. Moss, in London, a memorandum showing the price of quinine in the year 1852, from his father's price list. It was then 40s. per oz. If they wanted rhubarb cheaper, Mr. Usher could supply it; but whatever had been rewarded twice by the Society of Arts as a national benefit was certainly worthy of being introduced here.

Mr. RANSOM thought they were indebted to Mr. Usher for his interesting communication. The rhubarb was almost the only example of an English-grown drug that was not supposed to be of equal value to the foreign. If that supposition was mistaken, and it seemed not improbable, it would be interesting to have it proved, and it should be proved. Certainly there would be scope for much larger cultivation if it could be shown that medicinally

it was as useful as the Asiatic. With regard to henbane, he could also emphasise what Mr. Usher said with regard to the confusion between the annual and the biennial. The two drugs were entirely different. When the annual was ordered, the leaves of the biennial plant were often intended. As to the order of the value in which they were held, he was not quite sure whether Mr. Usher meant the value in price or the actual medicinal value of the different kinds. They had had some remarks on that subject from Mr. Gerrard a year or two ago, and he might probably have something to say now. He had been much interested in hearing that Mr. Usher had succeeded in preventing the attacks of insects on henbane, which had been a great difficulty with many growers, and should be glad if he could give some information as to how it was prevented.

Mr. GERRARD said he had done a little work in connection with the subject of henbane, both as regards growing and analytical examination of the plant itself and its various parts for the alkaloids contained. Early impressions were very difficult to get rid of. On the one hand, henbane was a very beautiful plant, as well as interesting, and produced rosette leaves the first year; then it grew up to a handsome plant, sometimes as tall as ten feet high. Naturally, being taught that the biennial henbane was the best, when they saw the plant in its natural condition, both the first and the second year's growth, the one being a comparatively insignificant small plant, you were led to consider that the one which you had been taught was the best and had seen was the most handsome plant, naturally must be the best. It often happened when you came to put matters to the test, things might be different. In the case of cinchona, there were large barks and small, and often the small barks were the better in quality. It was much the same with henbane. If you took the annual henbane leaves, not stalks with the flower tips, and submitted them to analysis to extract the alkaloids, they would be found to yield as near as possible the same percentage of alkaloids as the first year's biennial leaf or the second year's biennial leaf; but if you wanted to get henbane which would yield a much more active preparation than either, you must take the biennial root of the first year's growth when it was very large. You would get from that three or four times as much alkaloidal matter as from the leaves or tips of either kind at any period. A great deal might be said about the quality of henbane in connection with the mode of treatment. If the crop, whether annual or biennial, were carefully collected, rapidly dried with the leaf a bright green, well pre-

served, not tied up in paper parcels or thrown in corners, it would keep for a considerable time, and in the course of three or four years would be found almost as good as when first prepared. He had shown by analytical figures that a badly dried specimen, old and brown, had undergone a certain amount of change, and the alkaloidal properties had become low; it was, therefore, necessary that farmers should take care in preserving these drugs, which owed their activity to an alkaloid. Again, heat to atropine and hyoscyamine was very deleterious indeed. If you took a little alkaloid—the pure base, not the salt—and warmed it in water, it would lose 20 per cent. of its alkalinity by conversion into an acid body with a new base. He was pleased to hear from Mr. Usher that he had been able to get rid of those pests which were such a nuisance in connection with henbane cultivation. It would have been interesting had he told them how. He had cultivated it on a small scale, and found the insects very troublesome; they would consume the whole crop in a few days. The biennial henbane was generally looked upon in the market as the best article, and was high in price, but he thought that was purely sentimental on account of the flowering-tops. The first year's growth of the biennial henbane was undoubtedly as good in alkaloidal quality as the second year's biennial tips, and the first year's or annual henbane, if the crops were well farmed, was practically as good as the others.

Mr. USHER said he was not an analyst, and was not able to add anything on that part of the subject. The substance he used to protect henbane against the attacks of insects was a mixture of salt, soot, sulphur, and lime, in equal quantities.

The PRESIDENT, having proposed a vote of thanks to Mr. Usher, which was unanimously carried, said he was sorry to say that the remaining papers would have to be taken as read. He was quite sure that they would desire to express their sense of obligation to these gentlemen for their contributions. He might add that they were of equal value with those which had been under discussion the last two days. He moved that a hearty vote of thanks be accorded to the respective authors.

NOTE ON TINCTURA ERGOTÆ AMMONIATA.

By J. T. HORNBLOWER.

The subject of this note was suggested to the writer a short time back by a question being put to him as to why a sample of

tinct. ergot. ammon. remained clear on adding it to water, and another become cloudy. The question was therefore—Should the tincture remain clear on adding it to water (℥j. to 2 fl. ozs.) or not?

On looking at the subject in a cursory manner, I think one might be pardoned for saying the tincture should become cloudy, or even milky, seeing that the menstruum is spt. ammon. aromat.; and, indeed, if I had been asked if a tincture would do so, instead of being told it did not do so, I should have said yes. Accordingly, I added some to distilled water in the proportion of ℥j. to 2 fl. ozs., and the result was a clear mixture. Then came the question—What was the reason? This, I surmised, was owing to the large amount of fixed oil which ergot contains. It might be that this oil had the power of removing the essential oils from the spt. ammon. aromat., and to a great extent this proved to be right, but not quite so. The following experiments were then done to try and find the reason:—

Ten ounces of ergot were exhausted of oil with ·720 ether, the oil resulting being some 3½ ozs.

1. Half ounce of this oil was shaken up with 4½ fl. ozs. spt. ammon. aromat. (these quantities were used because ½ oz. oil would be about equal to 1½ ozs. ergot, which would equal 3 fl. ozs. tincture, which would require 4½ fl. ozs. spt. ammon. aromat. to produce it if made strictly B.P.C.). After standing, etc., and a portion filtered off, ℥j. of this spirit was added to 2 fl. ozs. distilled water, the result being a perfectly clear mixture.

2. Half ounce of the same oil was shaken up with 4½ fl. ozs. spt. aromat. sine ammonia (this being a spirit of the same alcoholic strength as spt. ammon. aromat., and containing the essential oils, but no ammonia). On filtering off a little of this spirit, and adding it to water as before, a cloudiness took place, but nothing approaching the milkiness formed on adding an equal quantity of spt. ammon. aromat. to water. The partial removal of the essential oils is, of course, due to the difference in solubility of these oils in the fixed oil and "spt. aromat."

3. To the mixture of this latter fixed oil and spt. aromat. sine ammonia, the proper amount of ammonia, caustic and carbonate, was added to form spt. ammon. aromat., and the mixture again well shaken for some time, and then a portion filtered off. This, on adding to water as before, remained quite clear. The addition of the ammonia (caustic) had evidently wrought the change, by the formation with the fixed oil of a small amount of soap, which

had doubtless the effect of keeping in solution, when added to water, that portion of the essential oils which the fixed oil had not removed.

4. One ounce of ergot was then taken, made into a No. 36 powder, and then into tincture with spt. aromat. sine ammonia. On adding this tincture to water as before, the same amount of cloudiness took place as when the "spt. aromat.," treated with oil as in No. 2 experiment, was used, thus showing that the oil either distributed through the ergot, or treated separately had practically the same effect on the "spt. aromat.," that being partially removing the essential oils from it.

5. The equivalent of 1 oz. ergot exhausted of its oil was now taken and made into tincture, B.P.C. This should have made a milky mixture with water if the fixed oil had been thoroughly removed from the ergot, as none being there it could neither act on the essential oils in the spirit nor the ammonia act on it. On diluting the tincture with water a thorough cloudiness took place, though not so much as a proportionate amount of spt. ammon. aromat. would have caused with water. The fixed oil was evidently not thoroughly removed from the ergot, or more cloudiness must have been produced, for on again treating a portion of this ergot with more ether and making another tincture, this, on adding to water, became more as expected. Of course, there was not sufficient fixed oil left in the ergot to effect a solvent action on the essential oils of the spt. ammon. aromat., but there evidently was sufficient to form soap enough to make the tincture remain more clear than it otherwise would have done on adding it to water.

6. To 2 fl. ozs. distilled water add 5 minims of a solution of hard soap (grs. 40 in 1 oz. spirit), and then add ʒj. spt. ammon. aromat. The mixture will become nearly clear, and on adding another 5 minims of soap solution, quite so; the presence of this amount of soap evidently keeping the essential oils in solution.

The reason therefore, I think, why tr. ergot. ammon. remains clear on adding it to water is that the fixed oil of the ergot, and the soap formed from it by the ammonia, respectively remove part, and prevent the remainder of the essential oils from being thrown from solution; this, however, can only apply when the whole of the tincture has been in contact with the ergot, as in percolation —for if made by maceration, and any deficiency in quantity of finished tincture made up by adding spt. ammon. aromat., a cloudiness would be produced dependent on the amount added.

THE ADAPTATION OF THE SOAP BASIS OF LIN. POT. IODID. C. SAPONE TO SOME OTHER B.P. LINIMENTS.

By E. W. Lucas, F.C.S.

The many advantages that the basis of liniment of potassium iodide has over the rest of the Pharmacopœia liniments induced the suggestion as to whether it would be practicable to adapt a similar basis to other preparations of the same class. It is exceedingly probable that such liniments would be more readily absorbed by the skin, while they would be much more cleanly and easy of application, and at the same time the danger of mistake for medicines for internal use would be minimised. The author, therefore, proposes the adoption of a soap basis, from which all of the liniments now dealt with could be readily prepared.

Take of—

Basis Saponis.

Soft soap	1 ounce.
Curd soap	5 ounces.
Glycerin	2 fluid ounces.
Distilled water	a sufficiency.

Reduce the curd soap to fine shreds, and dissolve it with the soft soap in 16 ounces of water, by the aid of gentle heat. Add the glycerin and sufficient distilled water to make the strained product weigh 1 lb. 10 ozs. Pour into a suitable vessel and allow to solidify.

Linimentum Aconiti.

Take of—

Alcoholic extract[1] of aconite	1½ ounces.
Distilled water	4 fluid ounces.
Soap basis	12 ounces.

Liquefy the soap basis on a water-bath, add the distilled water, and dissolve the extract of aconite in the mixture, and as soon as it begins to cool, pour into a large mortar, and stir briskly until a smooth paste is produced.

Linimentum Belladonnæ.

Take of—

Extract of belladonna (alcoholic)	1½ ounces.
Distilled water	4 fluid ounces.
Soap basis	12 ounces.

[1] Prepared in the same way as ext. belladon. alcoholic.

Liquefy the soap basis on a water-bath, add the distilled water, and dissolve the extract of belladonna in the mixture, and as soon as it begins to cool, pour into a large mortar, and stir briskly until a smooth paste is produced.

Linimentum Camphoræ Compositum.

Take of—

Camphor	2 ounces.
Oil of lavender	1 fluid drachm.
Strong solution of ammonia	5 fluid ounces.
Rectified spirit	2 „ „
Soap basis	14 ounces.

Dissolve the camphor and oil of lavender in the spirit, and add the solution by degrees to the previously melted but cool basis, stirring briskly after each addition. When nearly cold, add the solution of ammonia, and continue stirring until a smooth, creamy paste is produced.

Linimentum Iodi.

Take of—

Iodine,		
Iodide of potassium	of each	½ ounce.
Rectified spirit,		
Distilled water	of each	1 fluid ounce.
Soap basis		10 ounces.

Dissolve the iodine and potassium iodide in the spirit and water, and add the mixture by degrees to the previously liquefied soap basis. As soon as it begins to thicken, pour into a large mortar, and stir briskly until a smooth paste is produced.

This is about one half the strength of the Pharmacopœia liniment, but it will probably be found quite energetic enough, owing to its being more rapidly absorbed. The title of the present liniment it is proposed should be changed to pigmentum iodi, under which name it might be retained.

Linimentum Opii.

Take of—

Extract of opium	2 drachms.
Distilled water	2 fluid ounces.
Soap basis	10 ounces.

Dissolve the extract of opium in the water, add the previously liquefied soap basis, and as soon as it begins to thicken, pour into a large mortar, and stir briskly until a smooth paste is produced.

Linimentum Potassii Iodidi cum Sapone.

Take of—

Iodide of potassium	1½ ounces.
Oil of lemon	1 fluid drachm.
Distilled water	2 fluid ounces.
Soap basis	10 ounces.

Dissolve the iodide of potassium in the water and add it to the previously liquefied basis. As soon as it begins to thicken, add the oil of lemon, and pour the mixture into a large mortar and stir briskly until a smooth, creamy paste is produced.

Linimentum Saponis.

Take of—

Camphor, Rectified spirit	of each 1 ounce.
Oil of rosemary	½ „
Distilled water	2 fluid ounces.
Soap basis	18 ounces.

Dissolve the camphor in the oil of rosemary and spirit, and add by degrees to the liquefied but nearly cool basis, stirring constantly until a smooth, creamy paste is produced.

Linimentum Terebinthinæ.

Take of—

Soft soap, Castile soap in shavings	of each 1 ounce.
Distilled water	2 fluid ounces.
Camphor	1 ounce.
Oil of turpentine	16 fluid ounces.

Place the oil of turpentine in a narrow-mouthed bottle with the soaps and the camphor, and stand in a vessel of hot water, agitating occasionally until solution has been effected. Add the water all at once, and shake vigorously until a creamy white liniment is produced.

TINCTURE OF IODINE AND ITS ANALYSIS.

By J. F. Liverseege, F.I.C., Ph.C.

1. *Composition.*—The British Pharmacopœia orders half an ounce each of iodine and iodide of potassium to be dissolved in one pint of rectified spirit, which is required to contain 84 per cent. of absolute alcohol, and to have a specific gravity of ·838. The per-

centage by weight of the ingredients of the tincture can therefore be calculated. As it is practically inconvenient to weigh the portions of tincture for analysis, the composition in grammes per 100 c.c. is also required. If the Pharmacopœia gave the volume of the product or its specific gravity, these values could also be calculated; but as it does not, experiment is required. I found that when 2½ grammes each of iodine and iodide of potassium are dissolved in 100 c.c. of rectified spirit, the volume of the product is 101·2 c.c.

The theoretical composition of the tincture is therefore:—

	100 grammes contain — grammes	100 c.c.[1] contain — grammes.
Iodine	2·82	2·47
Iodide of potassium	2·82	2·47
Absolute alcohol	79·27	69·56
Water	15·09	13·25
	100·00	87·75

2. *Specific Gravity.*—This is conveniently taken with the Westphal balance, or a stoppered specific gravity bottle with a mark on the neck. If the temperature is about 60° F., the specific gravity thus found may be corrected by the addition or subtraction of ·0005 for each 1° F. above or below the normal temperature.

I have stated that 100 c.c. of the tincture should weigh 87·75 grammes; the specific gravity, therefore, should be ·8775. The only published statement I know gives the theoretical value as ·861 (Findlay, *Pharm. Journ.* [3], xix. 472), but does not say how this erroneous value is found.

The specific gravity bottle was calibrated to hold 50 grammes of water at 60° F. May I here express the hope that the new Pharmacopœia will supplement the somewhat indefinite statement (page xix.), "Specific gravities are to be taken at 60°," with the words, "and compared with distilled water at the same temperature."

3. *Iodine.*—This is readily determined by titrating 5 c.c. with sodium thiosulphate and starch. The reaction is so delicate that I prefer a solution weaker than that of the British Pharmacopœia, viz., one containing 13·7 grammes $Na_2S_2O_3 \cdot 5H_2O$ per litre; each c.c. of this is equivalent to ·007 iodine. I find that if com-

[1] As my pipettes are calibrated to contain a gramme of water for each c.c. marked on them, measured at 60° F., I here use the term "c.c." in that sense.

mercial "hypo" is dissolved in hot water, filtered and cooled, the small crystals when dry are pure, and may be directly weighed out for the solution without the necessity of standardisation with iodine. A solution of iodine in rectified spirit was calculated to contain 4·96 grammes per 100 c.c., and 4·93 was twice found.

4. *Potassium Iodide.*—I thought that by evaporating the tincture to dryness on the water-bath all the iodine would be volatilised, and that the potassium iodide might be weighed; though most of the iodine is lost, heating to 150° C. does not remove it all, and at a higher temperature part of the iodide of potassium is volatilised.

If 5 c.c. of tincture is evaporated to dryness in a dish with a flat bottom, and small quantities of absolute alcohol are repeatedly evaporated on the residue, all the iodine is volatilised, and after drying in the water-oven the residue may be weighed. As a check the salt is dissolved in water and titrated with volumetric silver solution, using potassium chromate as an indicator.

A solution of potassium iodide in rectified spirit was calculated to contain 4·92 grammes per 100 c.c., and 4·92 was twice found by weighing, while titration gave 4·91 and 4·87. The volatilisation of iodine was also tested by taking a measured quantity of a rectified spirit solution of potassium iodide, adding a solution of iodine in rectified spirit, evaporating to dryness, treating with absolute alcohol, weighing, and titrating. Another equal quantity was evaporated to dryness without addition of iodine, weighed, and titrated as a check. The results were:—

Iodide only— ·1115 KI by weighing; ·1100 KI by titration.
Iodide and iodine— ·1135 KI by weighing; ·1115 KI by titration.

In making the aqueous solution of the residue, I was puzzled by the presence of a pink colour, very similar to ferric sulphocyanide. Iron and iodine were both tested for with negative results; but as the colour is not obtained if porcelain dishes are used, and as the colour is fainter if no iodide is present, when the evaporation is much more rapid, and the iodine a shorter time in contact with the platinum, it appears probable that the pink colour is due to a minute quantity of iodide of platinum.

Neither weighing nor titration is absolutely accurate, as any other salt present is weighed as potassium iodide, and if any chloride is present the results of titration are too high; but for practical purposes either answers very well. I never find one-

tenth per cent. difference between the two results. The figures given below are the means of the two methods.

I may point out the alterations which have taken place in the amount of potassium iodide ordered by the Pharmacopœias. London, 1 oz.: British, 1864, ¼ oz.: 1885, ½ oz. to each pint of spirit. The foreign Pharmacopœias omit it altogether.

5. *Spirit.* (A.) *Direct Determination.*—Allen (Commercial Organic Analysis, i. 112) writes: "Mere distillation is sufficient to separate the alcohol . . . in tinctures of iodine, etc. . . . if they are first treated with soda in slight excess." I took 15 c.c. of a tincture of iodine, specific gravity ·8792, calculated to contain 69·07 grammes absolute alcohol per 100 c.c. made slightly alkaline with soda and diluted to about 60 c.c., when a reaction took place that might have been anticipated, and iodoform was deposited; the liquid on heating became clear, but the distillate contained a notable amount of iodoform, rendering its specific gravity too high, and the quantity of absolute alcohol, calculated therefrom, too low, viz., 65·65 grammes per 100 c.c. Experiment showed that the reaction took place, whatever was the order of mixing.

I then decolorised 15 c.c. of the same tincture with sodium thiosulphate, added a few drops of soda, diluted to 60 c.c., distilled about 45 c.c., diluted to 50 c.c., weighed and calculated by the formula:—

$$\left\{\begin{array}{c}\text{Grammes}\\ \text{absolute alcohol}\\ \text{per 100 c.c.}\end{array}\right\} = \frac{\left\{\begin{array}{c}\text{Per cent.}\\ \text{absolute alcohol}\\ \text{in distillate}\end{array}\right\} \times \left\{\begin{array}{c}\text{Weight of}\\ \text{distillate.}\end{array}\right\}}{\text{c.c. tincture taken.}}$$

The result was 69·67 against the theoretical 69·07; the error may be due to sulphur coming at the end of the process, and making the distillate slightly turbid.

(B.) *Indirect Estimation.*—If iodine or iodide of potassium is dissolved in spirit, the increase in its specific gravity is proportional to the weight dissolved; conversely, if the specific gravity of the tincture, the amount of iodine and potassium iodide present, and their influence on the specific gravity be known, the specific gravity of the spirit used for making the tincture may be calculated.

To determine the effect of iodine, 50 c.c. of rectified spirit were put in a stoppered specific gravity bottle with nine marks on the neck and weighed; from this the specific gravity of the spirit was

found, about 2·5 grammes of iodine were added, the increase in weight being the exact amount. When the iodine was dissolved, the volume was estimated by means of the marks on the neck, and this divided into the total weight gave the specific gravity of the solution. A second value was obtained by cooling till the volume was exactly at a mark when the temperature was taken, and the volume of 60° F. calculated by means of the co-efficient of expansion. I thus found that one gramme iodine in 100 c.c. of spirit increased the original specific gravity by ·0081, and similarly that one gramme potassium iodide increased the specific gravity by ·0079. As there is so little difference in these figures, and as the iodine and the iodide ought to be present in equal quantities, no appreciable error will be introduced if the sum of the iodine and the iodide is multiplied by the mean of the two results, viz., ·008. Therefore:—

$$\left\{\begin{array}{c}\text{Sp. gr. of the spirit}\\ \text{used for making}\\ \text{the tincture}\end{array}\right\} = \left\{\begin{array}{c}\text{Sp. gr. of}\\ \text{the}\\ \text{tincture}\end{array}\right\} - \left\{\begin{array}{c}1 + \text{KI in grammes}\\ \text{per 100 c.c.} \times \cdot 008.\end{array}\right\}$$

For example, a tincture of iodine had a specific gravity ·878, and contained 2·30 grammes iodine and 2·34 grammes potassium iodide per 100 c.c. Then the specific gravity of the spirit used for making the tincture = ·878 − [2·30 + 2·34 (·008)] = ·841, while the specific gravity of the spirit actually used was ·842.

(C.) *Approximate Estimation.*—Into a 500-grain graduated cylinder were successively put 50 fluid grains each of tincture and water, and 400 fluid grains of methylated ether (·717), and the mixture shaken. After standing, the aqueous deposit measured 65 fluid grains. Reference to my table (*Year-Book of Pharmacy*, 1891, p. 256) showed this indicated 75·4 per cent. of absolute alcohol, while 78·5 per cent. was calculated to be present.

6. *Analysis of Samples.*—Table I. contains those samples which vary less than 10 per cent. from the theoretical standard, and have been probably more or less carefully prepared according to the Pharmacopœia. Two samples were bought from unqualified vendors.

Table II. contains carelessly made or adulterated tinctures: two of these (Nos. 19 and 20) were bought from unqualified sellers, the remainder (in both tables) from retail chemists.

I also give the averages, which agree remarkably closely with theory. No. 25 is omitted from the average of the specific gravities, because of its wide divergence from any of the others.

Table I.

Number.	Specific gravity of—		Grammes per 100 c.c.	
	Tincture.	Spirit used (calculated).	Iodine.	Potassium Iodide.
1	·8675	—	2·34	—
2	·8810	—	2·41	—
3	·8835	—	2·59	—
4	·8855	—	2·68	—
5	·8775	·837	2·52	2·57
6	·8810	·838	2 66	2·69
7	·8805	·839	2·56	2·60
8	·8715	·831	2·35	2·75
9	·8705	·834	2·30	2·26
10	·8725	·836	2·31	2·23
11	·8735	·836	2·34	2·31
12	·8780	·840	2·39	2·38
13	·8775	·839	2·39	2·36
14	·8805	·840	2·58	2·53
15	·8805	·839	2·59	2·54
16	·8795	·839	2·54	2·53

Table II.

Number.	Specific gravity of—		Grammes per 100 c.c.	
	Tincture.	Spirit used (calculated).	Iodine.	Potassium Iodide.
17	·8805	—	3·06	—
18	·8790	—	2·85	—
19	·8825	—	2 80	—
20	·8725	—	1·95	—
21	·8835	·847	2·04	2·54
22	·8735	·840	2·75	1·51
23	·8615	·839	1·78	1·45
24	·8785	·840	2·74	2·08
25	·9560	·914	2·59	2·65
Theory	·8775	·838	2·47	2·47
Averages:				
1–16	·8775	·837	2·47	2·48
1–24	·8772	·838	—	—
1–25	—	—	2·48	2·31

THE CALIBRATION OF PIPETTES.

By J. F. Liverseege, F.I.C., Ph.C.

It is, I believe, a not uncommon practice to accept pipettes as accurate without calibration; and as I have never seen any figures given of their actual contents as sold, the following results may be of interest.

Before calibration it is advisable to ascertain that the pipettes are free from grease; if present, it may be removed by half filling the pipette with soda solution, and carefully heating the bulb with a spirit lamp, then thoroughly washing.

To obtain concordant results it is necessary to adopt a definite procedure in employing the pipette, for it be allowed to drain one time, blown out another, and only allowed to run out a third time, the amounts of liquid delivered will not be the same.

The pipettes and a beaker of distilled water are put near the balance and allowed to attain the temperature of the room. A flask is tared, the temperature of the water noted, the pipette filled with water, the outside wiped, adjusted to the mark, allowed to run out into the flask, drained five seconds, the surface of the liquid touched with the pipette, and the flask of water weighed.

Proceeding in this way, two determinations generally agree (irrespective of the sizes of the pipettes) to within a few milligrammes; in fact, in 60 per cent. of a number of determinations the difference was less than five milligrammes.

If the temperature of the water is not 15·5° C., it is corrected to that temperature by the following table, which is calculated from data given by Cassamajor (*Chemical News*, xxxv. 160 and 170).

Temperature C.	For each gramme or grain delivered subtract	Temperature C	For each gramme or grain delivered add
11°	·00049	16°	·00007
11·5°	·00045	16·5°	·00015
12°	·00040	17°	·00023
12·5°	·00035	17·5°	·00032
13°	·00030	18°	·00040
13·5°	·00025	18·5°	·00049
14°	·00019	19°	·00058
14·5°	·00013	20°	·00067
15°	·00007	20·5°	·00077

As the British Pharmacopœia requires a grain measure to be the volume of one grain of water measured at 15·5° C., and as the

fluid ounce is the volume of 437·5 grains of water at 16·66° C., it will be seen that a fluid ounce is not exactly 437·5 grain measures, but a trifle (·07 grain) more. This difference will not, therefore, account for the errors of the following British pipettes:—

Mark.	Grains of water delivered at 15·5°.	Error.	
		Grains.	Per cent. of contents.
1 oz.	434·0	−3·6	·83
½ "	216·8	−1·9	·89
⅕ "	88·6	+1·1	1·2
1/10 "	44·5	+ ·8	1·8

With regard to metric pipettes, there is a certain amount of doubt as to the temperature at which a pipette is expected to deliver a gramme for each cubic centimetre marked on it. Thorpe advocates 4° C. (the strict c.c.), Dittmar 15° C., Sutton "16° C. or 60° F.," while Fresenius requires 17·5° C. For most purposes it does not matter at what temperature they are calculated, so long as they are concordant with each other, and with the burettes and flasks used with them.

The following are the mean results of the examination of a series of metric pipettes:—The 10 (*b*), 3, 2, and 1 c.c. pipettes had the bulb at the bottom, the ½ c.c. had no bulb, and all the rest had the bulb in the middle of the stem.

Mark.	Grammes of water delivered at 15·5 C.	Error.	
		Gramme.	P.c of contents.
*100 c.c.	100·011	+·011	·01
*50	49·996	−·001	·00
30	29·881	−·119	·40
25	24·941	−·059	·24
20 (*a*)	20·045	+·045	·22
(*b*)	19·914	−·086	·43
15 (*a*)	14·984	−·016	·11
* (*b*)	15·000	0	0
10 (*a*)	9·869	−·131	1·31
* (*b*)	9·990	−·010	·10
(*c*)	9·946	−·054	·54
5 (*a*)	4·963	−·037	·74
(*b*)	4·972	−·028	·56
* 3	2·998	−·002	·04
2	1·973	−·027	·13
* 1	1·001	+·001	·01
½	·456	−·044	8·8

The variation in the direction (+ or −) and percentage of error (0 to 8·8) shows that there is no uniform system among the makers of pipettes, or that they are sold at too low a price to be consistent.

I have taken one gramme measured at 15·5° C. as a standard cubic centimetre, as it is a convenient temperature for calibration, and as it is the standard temperature for volumetric measurements. If the term cubic centimetre, as thus applied, be objected to as not strictly accurate, the expression "fluid gramme" may be used, as suggested by Dittmar.

Fresenius considers an error of one tenth per cent. of the contents allowable, and the errors of one third of them (those marked *) do not exceed this amount. Bearing in mind that the "fluid gramme" exceeds the cubic centimetre by one thousandth part, it will be seen that about the same proportion is condemned if the true cubic centimetre is taken as the standard.

In two cases the error exceeds 1 per cent., and in three more the error exceeds ½ per cent. This is hardly satisfactory, and the pipettes require correction for practical use.

An approximate correction may be made by the formula $h = \frac{C}{\pi r_2}$ where h = distance in cm. of correct mark from erroneous one, C = error in c.c. π = 3·1416 and r = half the internal diameter of the stem in cm., or by adding water from a burette to the pipette when full to the mark. After the approximate correction they were calibrated, and a further alteration made if required. The following are the results after correction :—

Mark.	Grammes of water delivered at 15·5 C.	Error.	
		Gramme.	Per cent. of contents.
30 c.c.	30·001	+·001	·00
25	24·999	−·001	·00
20 (*a*)	20·001	+·001	·00
(*b*)	19·999	−·001	·00
15 (*a*)	14·998	−·002	·02
10 (*a*)	9·997	−·003	·03
(*c*)	10·005	+·005	·05
5 (*a*)	5·005	+·005	·10
(*b*)	5·001	+·001	·02
2	2·003	+·003	·15
½	·506	+·006	1·2

EXTRACT OF INDIAN HEMP.

By David Hooper, F.I.C., F.C.S.,
Government Quinologist.

The chief medicinal preparation of Indian hemp is that part of the cultivated female plant of *Cannabis sativa* known as ganja, and the most important pharmaceutical preparation of ganja is the spirituous extract. Dr. W. B. O'Shaughnessy was the first to draw attention to the use of this plant in European medicine, and published a pamphlet on the subject in Calcutta in the year 1839. The history and therapeutics of ganja were very fully treated in the "Bengal Dispensatory" of 1842, pp. 579–601. Indian hemp and its preparations were introduced into the British Pharmacopœia of 1864 and 1867; before this, as far as I can ascertain, they were in the Dublin Pharmacopœia. Indian hemp, with its extract and tincture, was one of the few drugs that was allowed to pass into the Pharmacopœia of 1885 without any criticism, an indication, probably, of its decreasing popularity. For some years past the subject of *Extractum Cannabis Indicæ*, and the relative values of English and Indian extracts, has been on the Blue List of this Conference, but this year it has been omitted from the list of topics suggested for investigation. Before this drug takes a lower position in pharmacy than it at present occupies, I would venture to give my experience of the extracts of Indian hemp obtained from different sources, and compare them with extracts of English manufacture. My recent position of analyser to the Indian Hemp Drugs Commission has given me unprecedented opportunities of learning about the composition of Indian hemp. My remarks will have particular reference to the pharmacopœial extract, a preparation which contains the active principle of hemp. A summary of nearly fifty literary references to the chemistry of the drug, and a discussion on the active principle, based on some experiments now being conducted, will be left for a future occasion.

Preparation of the Extract.—Commercial samples of ganja contain from 5 to 40 per cent. of seeds, or, properly speaking, fruits, and, as the seeds yield 25 per cent. of oil largely soluble in alcohol, a spirituous extract would often contain a considerable quantity of fixed oil. In breaking up a sample of ganja the seeds that fall out should be rejected altogether. In all my analyses I removed as much seed as possible before the sample was reduced to coarse powder, and in this way resinous extracts of greater purity could be prepared.

Rectified spirit answered every purpose in extracting the different samples of ganja. In some cases where the resin was high, a stronger spirit was used as a solvent, but this did not effect the solution of a larger quantity of resin. Rectified spirit dissolved from the drug some water-soluble matters in addition to the resins, while absolute alcohol dissolved very little besides the resins. The following experiments will show the difference in the solvent power of spirit of different gravities on samples of ganja:—

	Rectified spirit extract.	Resins.	"Abs. alc." (80) extract.	Resins.
1	20·9	19·4	19 7	19·3
2	16·8	14·3	15·3	11·5
3	16·3	13·9	11·2	11·0
4 (Bhang) .	10·4	9·3	9·8	9·5

Amount of Extract in Ganja Samples.—Like all other drugs, the amount of active principle, which is here gauged by the resin contents, varies greatly in different samples. Dr. O'Shaughnessy, of Calcutta, obtained 20 parts of resinous extract from 100 parts of ganja. The ganja used was no doubt that cultivated at Navgaon in Raphahi District, Bengal, and known all over the north of India for its uniform richness in resin and its active properties. Mr. Savory (*Pharm. Journ.*, August, 1843) seems to be the first English pharmacist who published his experience in making an extract of Indian hemp. By a very exhaustive process, consisting in macerating the ganja in spirit for a week, and then percolating with hot spirit, he obtained 12 ounces of extract from 4 pounds, or 18¾ per cent. Indian hemp is official in the United States, and the process for preparing the extract is very similar to that of the B.P. F. J. Lammer (*Amer. Journ. Pharm*, November, 1886), by following the directions of the U.S.P., obtained 16·56 per cent. of finished extract.

In the following table are recorded some of the results of my examination of selected samples of ganja from various parts of India. The first column gives the percentage of rectified spirit extract evaporated to absolute dryness and calculated on the air-dried sample of ganja. The percentages of extract range from 14 5 in the Bijapur specimen to 31·0 in that from the Kistna district of Madras. The Bengal samples are all very high, and are, in fact, different preparations of the same crop of hemp. The

first kind is the "chur" ganja, or small matted pieces separated as much as possible from the stalks. The second kind is called "small flat twig," or ganja on small stalks. The third kind is "large flat twig," or ganja on large stalks. The fourth kind is known as "round ganja," prepared by rolling the fresh flowering

	Rectified spirit extract.	Washed spirit extract.	Ether and spirit-soluble resins.	% of spirit extract soluble in water.	Moisture in ganja.
Bengal, Navagon . . . 1	23·6	21·2	21·8	10·1	9·0
" " . . . 2	22·1	20·4	20·1	7·6	7·1
" " . . . 3	21 1	19·5	18·8	7·6	6·7
" " . . . 4	19·8	18·1	18·4	8·5	9·2
Bombay, Sholapur (exported)	20·9	19·4	20·1	7·1	7·1
Bombay, Khandesh . .	18·0	16·5	16·8	8·3	7·4
" Satara	17·8	16·6	16·6	7·0	8·9
Independent State, Hyderabad	17·7	16·8	16·5	5·0	7·6
N.W. Provinces, Basti .	17·2	15·8	—	8·1	10·3
Central Provinces, Nimar 1	16·7	15·0	15·6	10·2	8·4
" " " 2	15·1	13·7	14·4	9·2	8·6
Bombay, Ahmednagar . 1	16·7	15·4	15·4	7·7	12·4
" " . 2	16·2	15·2	14·9	6·1	11·6
" " . 3	14·6	13·4	13·3	8·2	9·8
" Nasik	16·8	14·3	14·3	14·8	8·2
" Sholapur . . .	14·8	14·0	13·9	5·4	8·4
N.W. Provinces, Ghazipur	17·1	13·7	13·8	19·8	10·0
Sind	16·3	13·9	14·7	14·7	8·4
Bombay, Surat	15·6	13·4	14·1	14·3	10·0
" Bijapur. . . .	14·5	13·4	13·4	7·5	9·2
Madras, Kistna Dist. . .	31·0	24·0	23·4	22·5	7·6
" Ootacamund . .	28·1	20·8	20·1	25·9	9·8
" Ganjam	23·7	18·0	17·6	24·0	10·3
" Bangalore . . .	21·6	17·0	17·3	21·3	8·2
" Tanjore	24·1	15·9	16·1	31·0	9·7
" Madras City . .	19·4	13·0	13·2	32·9	7·9

and fruiting tops by the hands or feet until they assume the shape of unfinished cigars. The ganja prepared in Sholapur is the best in the Bombay Presidency, although the exported product is much richer than that purchased locally. The samples from Ahmednagar were classified according to the price per maund, No. 1 and 3 realising the highest and lowest price respectively. It will be seen that the spirit extracts and resin contents accord with the market value of these samples. The examination of ganjas from different parts of India shows that, as far as the amount of resins is concerned, the samples from Eastern Bengal do not stand alone in their excellence. Dr. Watt, in 1886 and 1887 (*Pharm. Journ.*,

[3], xvii., pp. 415 and 825), pointed out the difference in the duty imposed on Bengal ganja compared with that of Bombay and Madras, and suggested that the Bengal ganja only should be used in the manufacture of the extract. He also concluded that the reputation of the extract had declined in Europe, because it was being made from inferior hemp. Unless there is proved to be a very great variation in physiological action of the extract from Bengal, and that from other places, no drug dealer would think of paying ten times the price for a similar article, merely for the sake of its name, or because it yields a little more resin. With regard to the Madras samples, those from Ootacamund, Bangalore, Tanjore, and Madras City were from one cultivating and manufacturing centre in the Javadi Hills in North Arcot. The figures attached to these samples show the absence of that uniformity met with in the analysis of the kinds of Bengal ganja.

Composition of the Extract.—Each sample of extract of Indian hemp yields a certain amount of substances soluble in water. This amount can be estimated by washing the extract with small quantities of hot water until nothing more is dissolved, and then drying and weighing the resinous residue left in the capsule. In the second column of the foregoing table will be found the weights of the washed spirituous extracts expressed in percentages on the air-dried ganjas. The third column shows the results of control estimations, which consisted in exhausting the ganjas directly with ether, then with ether separating the resin from the spirit extract, and adding together the ether and spirit-soluble resins after drying and weighing. The chief constituent of the extract is a neutral resin of a brown colour and tough consistence, soluble in petroleum ether, benzol, ether, carbon bisulphide, and amylic and ethylic alcohol, insoluble in alkalies, and leaving no ash when ignited. This resin contains the active principle. A small quantity of resin acid, about $\frac{1}{2}$ per cent., is present in all the samples. This has been found by Dr. D. Prain, of Calcutta, to be physiologically inactive. Oil, fat, wax, and chlorophyll also enter into the composition of the spirituous extract insoluble in water.

The water-soluble substances removed from the extract are chemically interesting, although not yet proved to be medicinally active. An alkaloid is present in nearly all the fresh samples of ganja; it occurs only in traces in older specimens, and is altogether absent in extracts that have been kept for some years. Ammonia is often associated with this alkaloid in fresh hemp; it exists alone in older drugs, and is frequently found only in traces

in old extracts. The alkaloid and ammonia are combined in the plant juices with one or more organic acids. One of these acids has the properties of citric acid, and another gives a yellow colour with lead acetate solution, and resembles an amorphous organic acid often found in plants. A substance is present in the extract which gives a purplish-black colour with ferric chloride, rapidly turning into a brown precipitate, and the precipitate dissolves in soda liquor with a red colour. Sugar has not to my knowledge been detected before in hemp drugs, but it is present in all the Madras ganjas examined, and in the leaves only from cultivated and wild plants from other districts. Traces of sugar were found in some of the Bengal and Bombay ganjas, nearly 5 per cent. was present in the sample from Ghazipur in the North-Western Provinces, and the Madras samples contained from 6 to 7 per cent. A glance at the fourth column in the table will show how the sugar increases the proportion of spirit extract soluble in water in these samples. The sugar was amorphous, and easily reduced Fehling's solution.

Examination of Commercial Extracts.—I have obtained three samples of *Ext. cannabis indicæ* made in England, and have examined them with the object of comparing them with the above extracts made from Indian material.

1. Sap-green colour, hard consistence, homogeneous under the microscope.

2. Sap-green colour with brown specks observable under the microscope, rather soft consistence.

3. Dull green colour and soft consistence. Microscope revealed the presence of brown specks, hairs, glands, cubical crystals (chloride potassium), and prisms (nitre).

	Moisture.	Ash.	Water-soluble extract.
1 . . .	4·20	1·52	6·25
2 . . .	6·65	2·21	12·51
3 . . .	7·00	3·70	16·66

The first sample was a portion of very old stock of extract; the second sample was also very ancient, some brown juice and mouldy particles were on the sides of the vessel in which it was kept; the third sample was said to be from a fresh consignment. From the microscopical and chemical examinations, we should consider the first sample to be the best, as it yields the largest proportion

of pure resins, and the third sample the worst. It would seem that the ash bears a certain ratio to the water-soluble substances, and is traceable to the saline constituents of the plant. Manganese is present in the ash of Indian hemp grown in different localities, and was found in the ash of the extracts. On igniting the aqueous extract obtained from the third sample, deflagration ensued, owing to the potassium nitrate present. Nitre has been found in Indian hemp by Messrs. T. and H. Smith (*Pharm. Journ.*, April 18, 1874). Its presence in the spirit of wine extract was accounted for by the supposition that other bodies were present to aid its solution.

After observing the dull olive-green colour of the extracts obtained from a large number of ganjas, I could not help noticing the very bright green tint of the commercial extracts when spread out on glass dishes, and I was not surprised to find copper in each sample. When the extracts were burnt in a platinum dish the copper present communicated a green colour to the flame, and the ash of each extract when dissolved in nitric acid and the solution saturated with ammonia resulted in a deep blue solution. The presence of this metal in manufactured extracts has been pointed out by different chemists, and it has been shown by Dr. Squibb and Mr. H. Maglagan (*Pharm. Journ.*, October 18, 1884) that its contamination of the extract cannot be prevented when copper evaporating pans are used. In face of these experiments, I was amazed to find that in a paper published in the *Pharm. Zeitung* (*Chem. and Drugg.*, June 9, 1894, p. 802) a firm of manufacturing pharmacists has tried to attribute the copper found in extracts to its presence in the drug themselves. I have examined the ash of bhang and ganja and have not discovered copper, but the amount of this metal in the extracts is decidedly higher than that shown in the paper (24 milligrammes per kilo).

Ganjas always lose their strength when kept for some time, and many dealers in India obtain new supplies annually, and always consider the drug worthless after being kept three years. This is a matter worthy of consideration in England with reference to the extract, and the failure of the action of the drug owing to the decomposition of its active principle is probably the cause of its downfall in medical estimation.

SOME FALLACIES IN THE TESTING OF ESSENCE OF LEMON.

By Arthur A. Barrett,
Pharmaceutical Chemist, Messina.

The object of this short note is to draw attention to the absolute worthlessness of the tests in common use for the examination of the purity of essence of lemon.

Until a few years ago almost every buyer contented himself with rubbing a little on his hand and smelling it, but repeated cases of essence "changing" into turpentine have forced upon them the desirability of relying on some chemical or physical test which should be more accurate.

As in so many other cases, Germany led the way, and a well-known firm advertised largely recommending the use of the polarimeter as a test.

Although it is the object of this note to show how entirely useless is this test, yet it undoubtedly has done good work, and has prepared the way for the acceptance of a really scientific test which, in my opinion, is certain to be evolved during the next year or two.

During the last two years I have had a polarimeter in almost constant operation, and during the lemon season have often examined as many as twelve samples of essence a day with it.

The result has proved that genuine essence may differ in its optical activity between $+57°$ and $+72°$. As the addition of 5 per cent. of raw turpentine to genuine essence only makes a difference of 4 or 5 degrees in the rotation, it is clear that such a test is one that cannot be relied on.

As regards the limits above mentioned, it is only fair to say that they are exceptional, and in the case of the higher reading I cannot absolutely guarantee it, but $+69°$ is not so uncommon. In the case of the essence with the low reading of $+57$, I was so altogether incredulous that I had some of the lemons brought to my works, and the essence extracted by my own employés with the same result.

It is rather remarkable that the maturity or otherwise of the lemons does not materially affect the reading, but the district in which the lemons grow makes a great difference, as may be seen from the following table, which gives the average results obtained:—

Essence from Aci Reale and district .	+61.
Immediate vicinity of Messina . .	+62.
Giarre Giardini Mascali . . .	+63-64.
Barcellona (Sicily)	+66-67.

All the above measurements were made with a 100 mm. tube and ordinary artificial light. Where great accuracy is required, sodium light is desirable, but I do not find such a refinement necessary.

During the present year several Messina firms have invested in polariscopes, and being without scientific assistance some very curious mistakes have resulted.

In a letter to the American consul, published in the consular reports for May, 1894, by the Department of State at Washington, and which, I may say, contains a valuable report on the Messina essence trade, one of them writes:—

"The requisites which modern science has found to distinguish the adulterated essence from the pure must be—

Essence of Lemon.

Specific weight 0·8587 . . .	15° C.
Opt. rotation +62	100 mm. tube.
Index of refraction 1·476 . . .	20° C."

It is clear, therefore, that this firm must continue to buy its lemons from the same district, or by their own tests their essence may be rejected as adulterated.

The second objection to the general adoption of this test is the great assistance which it gives to fraud.

The remark is not original, but testing by the polarimeter is like mixing black and white, and when you see grey, thinking you have got purity.

In this case everything is ready to hand for the mixing process. Turpentine as used in Messina is always lævorotatory, whilst essence of sweet orange is powerfully dextrorotatory, +98° being the average. It is, therefore, only the matter of a simple proportion sum to get a mixture indistinguishable polarimetrically from essence of lemon. I would state the exact proportions, but the object of this note is not to assist fraud but to expose it.

Shortly after the boom in polariscopes, which took place here at the beginning of this season, I was waited on by one of the local turpentine refiners, who told me that he had modified his "refining" process in this way by adding to it some very cheap distilled essence of orange, and it was now absolutely impossible

to detect its presence. In fact, he declared that business being slack he had himself mixed essence, and sold it to a Messina dealer as genuine, after he had tested it with the macchinetta, as they call it here.

In any other country the avowal of such a proceeding would very likely lead to legal proceedings, but here it is only considered as being sharp business, the addition of turpentine to essence being considered to be almost sanctioned by long use.

The Refractometer.—During the current year another machine has been introduced here for the optical examination of essence. It is a pretty little machine, and only requires a drop of essence for a test. I commend its use by chemists examining oils generally, but for the examination of lemon I do not find it of any use. A few experiments showed me that of the two kinds of turpentine used here, ordinary French and the kind sold as citronina, the one increased and the other diminished the reading, and the presence of 5 per cent. of either made only a difference of a fraction of a degree. Further, the instrument is extremely sensitive to changes of temperature. For the present, therefore, my instrument is relegated to the museum.

Perhaps the commonest test known is the specific gravity, and this is literally subject to change with every wind that blows. Just think of the enormous surface exposed to the air by a garden of lemons, and think that every drop of essence is pressed out by a man's fingers, runs over his hand, and is finally absorbed by the pores of a sponge. Then remember that in Sicily we get the sirocco—a hot wind from the Sahara—and you will not be surprised that evaporation at such times is considerable, with increase of specific gravity. On such occasions the yield of essence will fall five or even ten per cent., although every precaution may be taken in the workroom to exclude draughts.

The only remaining test in common use to which I need now refer is the test for mineral oil with alcohol or by evaporation on a piece of paper. Both of these tests are delicate and reliable.

I prefer to use flimsy, or the paper used for packing lemons, myself for making this test.

The various empirical tests—butyrate of copper, etc.—proposed from time to time, and which may be found scattered up and down the periodical literature of the past, are not in common use, nor do they merit attention.

The direction in which progress is to be looked for now is chemical rather than physical—optical activity—refraction of

light and specific gravity have all been tried in turn, and though not without some value, leave much to desire. The estimation of the citral naturally presents itself, but it is present in too variable a proportion to be useful as a test of genuineness. Its utility is rather as an assay. I may mention, in passing, the work of Messrs. Benedikt and Strache (*Monatsh. f. Chemie*, April, 1893). The recent memoirs have probably escaped me owing to my being so far away from any scientific library.

What is wanted is to select some one constituent which is present in constant proportion, and estimate this.

Although in the commencement of this paper I looked forward to the near advent of a test which should be of some use, and have sketched out the lines on which it should run, yet chemical science will never be able to say more than this essence contains or does not contain an added adulterant, or this essence contains so much citral and that other so much.

The fine gradations of quality which make the essence of one maker preferred and the essence of another only saleable at a reduction are, and always will be, incapable of exact measurement.

Compare the fragrance of essence made with scientific care from fruit freshly gathered off the trees and rapidly filtered and hermetically sealed down, with the essence made by the ignorant trapettari. His fruit is stale, perhaps half rotten; he works in a hovel innocent of drainage; his sponges are old and never washed, full of a putrefying mass of lemon lice (pidocehia), bird droppings, and all sorts of dirt.

Is the essence he makes pure? Of course it is, if he puts nothing in. But is it worth the same as the other? Of course not.

NOTES ON RHUBARB.

By B. S. Proctor, F.I.C.

About the year 1868 I commenced some experiments on Rhubarb root, which have been followed at intervals by others having various aims.

The work has remained in a fragmentary condition, some of the results being published,[1] though perhaps not readily accessible to the pharmacist.

The present paper has for its object the putting into a more

[1] See *Transactions of Newcastle Chemical Society*, April, 1869, etc.

connected form the various points of pharmaceutical interest which have been noted from time to time, together with such additional experimental results now obtained as the evident gaps in the old matter made necessary.

The first experiments were suggested by a conversation with a commercial traveller, who was boasting of the very fine quality of his carefully trimmed rhubarb root, and who afterwards offered me "the trimmings" as suitable for making tincture or infusion, with the assurance that *they were just as good* for these purposes as the trimmed roots, and much cheaper.

The question suggested itself—If the trimmings are just as good, what is the use of trimming the roots? I was quite disposed to believe that the dark exterior of the root was quite as good medicinally as the prettier looking interior; and, judging from other cases, we might anticipate a greater richness in the active principles. I felt that it was not creditable to the pharmacist to be guided in his judgment of the quality of the rhubarb of commerce, whether in lump or powder, simply or mainly by its beauty of appearance, and I undertook the first experiments with the view of throwing some light upon this subject.

A lump of root, of the commercial quality known as Indian Rhubarb, not trimmed, was split, and the central part scooped out of one half and finely powdered by drying and rubbing in the mortar. When fine the powder had not the full yellow colour of commercial powdered rhubarb, but when moistened with spirit and rubbed dry the colour was improved. When moistened with water, rubbed into a paste, and again dried and powdered, it had a full yellow colour. The total of this interior portion weighed 180 grains.

The exterior or cortical portion was more difficult to powder, and when fine was rather darker and the tone of the colour inclined towards greenish yellow. The colour was richer but not paler by treatment with water as above. The total weight of the exterior portion was 400 grains.

Central.

100 grains of the powder obtained from the centre of the root, approximately exhausted by maceration with six successive ounces of rectified spirit, yielded 30 grains of dry extract, which looked nearly black in mass, but was dark yellow when powdered.

Cortical.

100 grains of the powder from the exterior portion of the root,

exhausted in the same manner, yielded 36 grains of dry extract, having similar characters to the previous.

It thus appears, as far as this specimen of root is concerned, that the exterior of the root yields a darker powder than the interior, and that the powder is richer in such extractive matters as are soluble in rectified spirit. This is pretty much what was expected from the known fact that the bark of a plant is generally the portion which is richest in its active principles, but the difference between 30 and 36 per cent. is less than might have been expected. As I had no ground for a definite expectation, it did not at that time strike me so forcibly as it has done more recently in the light of some other observations of a purely physical character.

Migration of Dissolved Matter.

When prepared chalk is made into pencils by working into a paste with dilute mucilage of acacia, rolling out and drying, the exterior becomes very hard from the accumulation of the gum on the outside, while the interior remains comparatively soft; this takes place to a smaller degree with the less perfectly soluble gum tragacanth, and is not at all observable when clay has been used instead of gum to give the chalk the required firmness. When the pencil is in its moist plastic state, evaporation can only take place from the surface, and the interior becomes dry mainly from the passage of the fluid by capillary attraction to the outside which has become dry. *Water* evaporates from the outside, and *mucilage* is conveyed by capillarity from the inside to take its place; thus by degrees the gum acacia accumulates at the surface. This consideration is instructive as a guide to the cause of the greater richness of the outer portions of plants in the soluble constituents of their juices. In this experiment we are dealing with a porous body quite free from colloid properties, and a liquid, which though of a viscid nature in its concentrated state, is freely fluid in the dilute condition which holds at the beginning of the experiment. The filtration of the liquor through the pores of the chalk has not power to separate the acacia from the water; but in the case of tragacanth, the solution of which is less perfect, or we might say very imperfect, all the water may evaporate from the surface with but little increase of gum there. The mucilage containing only a small portion which is in true solution, and a large portion which is a gelatinous pulp diffused in the former; the pulp remains diffused through the mass, the soluble portion only accumulating at the surface. In

the third case, where clay is used, every particle of which is in the pulpy state, and no part dissolved, the whole of the water evaporates from the surface, while the whole of the clay remains equally distributed through the mass.

From the large proportion of matter soluble in water which rhubarb root contains, we might expect the transference from the centre to the exterior of the root to be considerable—greater at least than indicated in the experiment quoted, the difference observed being only between 30 in the centre and 36 in the outside. It suggests the propriety of repeating the experiment with a portion of root divided into three or more concentric zones, the outer being only skin-deep instead of about half the thickness; but before repeating analyses involving so much work as rhubarb root requires, it was felt desirable to try the results of the transference of soluble matter in the simplest way in which it could be tested.

Migration of Permanganate in Porous Mass.

With this view I mixed 2 ounces of plaster of Paris with solution of permanganate of potassium of the B.P. strength (1 per cent.), and cast it into a cylinder 2 inches long by $1\frac{3}{8}$ inches diameter. Put into a warm place to dry till it ceased to lose weight, it was split, and the colour was found to be almost entirely on the outside. A few grains taken from the middle, and an equal quantity from the outside, were diffused in equal quantities of water; the interior portion imparted a very pale yellow-brown tint free from appreciable pink colour, while the outside yielded a rich purple solution probably containing something like a thousand times as much of the permanganate. The thickness of the coloured outside of the cylinder was very small and pretty clearly marked. On scraping off the surface to the depth of about $\frac{1}{50}$ of an inch, almost all the permanganate was removed. The portion scraped off weighed 1·4 grain, and was diffused in an ounce of water. The scraping being continued on the same patch till a second $\frac{1}{50}$ of an inch had been removed, 1·4 grain of this powder was diffused in another ounce of water, and yielded so pale a solution as indicated only $\frac{1}{100}$ of the quantity of permanganate which was contained in the first. The same quantity scraped from the centre of the cylinder gave a yellow turbid liquor, which after filtration was clear and colourless, showing conclusively that where a perfect solution is concerned, and there is no chemical or physical combination between the dissolved matter and the absorbent body, the accumulation of the former is very closely limited to the surface of the latter.

Migration in Colloid Masses.

Rhubarb and other roots will of course differ greatly from this cylinder of plaster in having various vegetable tissues which are not only porous, but are in a state of colloid hydration, and the contents of their juices differ in the small quantity of crystalloid matter and the great preponderance of colloids which they contain.

Salines, sugar, gum, and pectous substances might be expected to give results varying between the extremes observed in the permanganate cylinder and the clay-chalk pencil. We might expect to find the crystalloid salines to accumulate on the outside to a large extent, comparable to the permanganate, so long as the transference of water by capillarity went on, but their accumulation at the surface would be interfered with by what may be regarded as dialysis backwards. The juice undergoing concentration by evaporation at the surface would soon become so much more saline than that within, as to cause some extent of crystalloid diffusion into the juice continuing to occupy the inner parts of the root.

The soluble colloids might be expected to accumulate near the surface until the concentration of the juice rendered it so viscid that it ceased to be effected by capillarity; after which the drying would go on by means of a diffusive passage of the water through the colloids, whether these be tissues, pectous matter, or viscid solutions.

The next experiment which I made for the elucidation of the passage of soluble matter through the mass, was similar to the permanganate, but substituting the soluble matter of rhubarb root.

Migration of Rhubarb Extract in Plaster of Paris.

A drachm of B.P. extract of rhubarb was dissolved in an ounce of water, filtered, and the clear solution mixed with 2 ounces of plaster of Paris, and cast into a cylinder about $1\frac{3}{8}$ inch in diameter by 2 inches long. This was dried by exposure to the air in a warm place till it ceased to lose weight. It was then split open, and three portions of 10 grains each obtained,—the first by scraping from the outside to the depth of $\frac{1}{20}$ of an inch, the second by scraping a second $\frac{1}{20}$ of an inch from the surface already scraped, and the third by scraping from the centre of the cylinder. These powders were diffused through three separate ounces of water, shaken repeatedly during twenty-four hours, and filtered. The clear filtrates were evaporated, and weighed to give total soluble matter, then burnt off and weighed as mineral matter or ash, the

differences being taken as vegetable extract. In this way it was found that the—

	Total soluble.	Extract.	Ash.
Exterior contained	1·8	0·9	0·9
Second $\frac{1}{10}$ inch	1·4	0·6	0·8
Interior	1·2	0·3	0·9

These figures show that the accumulation of the extractive matter on the surface is not so sharply accentuated as in the case of permanganate, but that it is very greatly in excess of the results obtained from the root.

Migration in Colloids.

The next step requiring elucidation was in regard to the movement of colloid and crystalloid matters when diffused through the substance of a hydrated colloid—to what extent will gum, sugar, or salt accumulate at the surface of a cylinder of gelatine, these matters being dissolved in the water with which the gelatine has been converted into a cylinder of jelly.

Migration in purely Colloid Masses.

Three cylinders of jelly were formed, the first (*A*) contained—

Gelatine	3j.
Sugar	3j.
Water	3j.

melted together and cast into a cylinder, which was gradually dried, first at atmospheric temperatures, then at about 90° F.

The second (*B*) was made in the same way, but with a fluid drachm of caramel solution in place of sugar.

The third (*C*), having a drachm of iodide of potassium in place of sugar, was found to require doubling of the quantity of gelatine to give it sufficient firmness.

When these were all approximately dry, portions were taken from the exterior and from the centre of each for comparison. Five grains from the outside of *A* yielded to an under-proof spirit 2·9 grains, and five grains from the inside yielded 3·15 grains. As the experiment was not conducted under conditions to obtain great accuracy, these results may be regarded as showing no material difference between the inside and the out, either as regards sugar or that portion of the gelatine soluble in spirit of that strength.

Five grains from the outside of *B*, dissolved in half an ounce of warm water, gave a brown solution having just the same depth of colour as a similar solution made from 5 grains of the inside of the same cylinder.

Five-grain samples taken from the outside and inside of *C*, exhausted with spirit and precipitated with nitrate of silver, the outside yielded 1·3 grains, and the inside 1·35 of iodide of silver.

No Migration in Colloids.

From these results I conclude that neither crystalloid nor colloid bodies show any appreciable tendency to migrate through the substance of a colloid during the evaporation of the water of its hydration.

Migration in a Mass of Colloid and Fibrous Matter.

The one remaining point to be determined which has a bearing upon the phase of my subject, was the action which would take place in a cylinder composed of colloid and fibrous matter, and in this respect resembling the natural root.

With this view I prepared two cylinders of woody fibre and mucilaginous matter. Pharmaceutical powdered quassia which had been deprived of its soluble matter by exhaustion with water afforded a ready supply of suitable material.[1] An ounce of this was made into a paste with ½ ounce each of sugar and gum acacia, and 3 ounces of water; this was pressed into a chip box, and when firm enough to handle, the box was stripped off and the drying continued.

The second cylinder was made with an ounce of the same fibrous powder, 60 grains of gum tragacanth, 120 grains of common salt, and 2 ounces of water. When these two cylinders were dry, the first was hard on the outside, but spongy in the centre. The second was not so hard on the surface, but was firm all through, confirming the previously noted tendency of tragacanth to migrate very little or not at all under circumstances in which acacia migrates to a considerable extent. Analysis of 10 grains of the interior of the acacia cylinder gave roughly—

Gum	0·5
Sugar	0·5
Insoluble	9·2

Ten grains from the exterior of the same gave—

Gum	2·6
Sugar	1·8
Insoluble	5·9

[1] A material which I use in dispensing to give firmness to pill masses which are liable to fall out of shape.

A similar examination of the tragacanth cylinder, 10 grains of the interior gave—

Salt	2·0
Gum and insoluble	8·0

while 10 grains from the exterior of the same yielded—

Salt	3·35
Gum and insoluble	6·65

The lesson to be learned from these results is that matter *in solution* migrates to the surface of porous masses in drying. Gum acacia, which is a soluble colloid, acting thus as freely as sugar, though the latter has twice its diffusibility; and gelatinous or semi-gelatinous matters prevent or diminish this migration according as they constitute the whole, or a portion, of the material from which the evaporation of the solution has to take place. In the gelatine, no migration of K I could be detected. In the wood and gum migration took place to a notable extent, and in the plaster of Paris it was extremely active.

Viewed in the light of these results, there ceases to be any wonder, either at the outside of the rhubarb root being richer than the centre, or at the difference existing only to the limited extent which the old experiments indicated.

Probably quick or slow drying, compact or spongy roots, and other circumstances may very much influence the migration of the soluble matters in the rhubarb.

Solvents of Active Constituents of Rhubarb. Cathartic Acid.

Roughly stated, rhubarb yields to spirit pretty readily the extractive matters upon which its medicinal value depends, after which it yields to cold water mucilaginous matters probably inert, the remainder being vegetable tissue, starch, bassorin, and oxalate of lime, which are also inert. The alcoholic extraction is no doubt much influenced by the strength of the spirit used; but though the purgative principle of rhubarb is said to be cathartic acid, and the active matter of senna is known by the same name, proof spirit appears to extract the purgative properties of rhubarb, while the spirit requires to be reduced a little below proof before it becomes satisfactory as a solvent for the cathartic acid of senna. The action of solvents upon the two portions of rhubarb indicated in my experiments of 1867 are worth noting, though the selection of solvents was not so good as it might have been in the light of subsequent experience.

The results were as follows:—

Rhubarb Root.

	Cortical.	Central.
Extracted by rectified spirit .	36·0	30·0
„ H Cl and proof spirit [1] .	16·0	17·0
„ K H O and water .	26·5	26·0
Insoluble residue	21·5	27·0

Ash Cortical v. *Central.*

When the same samples were treated with the spirit and water (1 to 10), as directed by the Pharmacopœia of that date for producing the medicinal extract, the results were as follows:—

	Cortical.	Central.
Extract	49·4	37·0
Marc consisting of combustible matter	47·6	48·0
Ash	5·4	12·0
	102·4	97·0

Ash of Rhubarb.

As the ash was mainly calcium carbonate, representing oxalate in the marc before burning, a correction would make the totals read respectively 105 and 104, probably consequent upon retention of moisture in the extract. This being considered a rather striking difference in the quantity of ash obtained from two parts of the same piece of root, it was thought desirable to make a third examination for ash, taking the extreme outside from the reserved half of the same piece of root; this yielded 9·6 per cent. of ash, of which 3·4 was soluble in water and the remainder in H Cl. The 6·2 insoluble in water suggests that part of the lime in the root exists as some soluble salt removed by the extraction in the case of the cortical sample. As a check upon this, 10 grains of the alcoholic extract was burnt off, and left an ash of which the insoluble was very small, but sufficed to give indications of lime, alumina, and iron. Ten grains of the spirit and water extract burnt off gave an ash, which stated in percentage of the root was—

Soluble in water	3·3
Insoluble	1·1

This is fairly concordant with the ash of the marc. 100 grains of this sample contained 9·8 of ash, of which 4·4 would be found in the extract, and 5·4 in the marc. The soluble ash consisted of carbonate, sulphate, and chloride of potassium; the insoluble consisted of carbonate of calcium and oxides of iron and aluminium.

[1] This was intended to extract oxalate of calcium, etc., but proved to have very imperfect action on the raphides.

The centre of another piece of root, which appeared to have more white veins than the root previously operated upon, was found to yield 14·86 per cent. of ash.[1]

14 8 per cent. Ash equal 24 to 25 per cent. valueless Salines.

The bulk of the ash as weighed was calcium carbonate, and no doubt was mainly calcium oxalate in the root before burning off. The other bases present would also partly exist in combination with organic acids; the root may thus contain 24 or 25 per cent. of saline matters of no medicinal value. This appears a large quantity, but still falls short of the 35 to 40 per cent. of oxalate of lime which Mr. Queckett is said to have obtained from rhubarb.

Queckett on Raphides.

When in 1868 I obtained the above estimates of ash, I considered the 14 86 an exceptional quantity, and felt tempted to look upon the quotation from Queckett as a possible error.

Pharmacographia on Ash.

I subsequently found in "Pharmacographia" (1874) a still greater yield. The statement runs thus:—"Two samples of good China rhubarb, dried at 100° C. and incinerated, yielded respectively 12·9 and 13·87 per cent. of ash. Another sample which we had particularly selected on account of its pale tint afforded us no less than 43·27 per cent. of ash. The ash consists of carbonates of calcium and potassium."[2]

If we assume that as usual the bulk of the ash in this case was (say about 33·0) calcium carbonate, which had existed in the root as oxalate, and the carbonate of potassium had also existed as an organic salt—it was evidently not a carbonate before incineration, or the root would not have been a pale colour—we should have this sample containing 58 to 60 per cent. of these salts, leaving only 40 to 42 per cent. for the total of all the other constituents. It would have been a matter of interest in connection with this abnormal root to have known also whether the raphides were accumulated in the central rather than in the cortical parts of the root, as I have observed in some other cases.

[1] The rhubarb was burnt in a platinum capsule till it ceased to show any combustion or any appearance of charcoal; it was then moistened with nitric acid and again heated to redness to ensure total destruction of combustible matter, then treated with solution of carbonate of ammonium that the calcium might be weighed as carbonate rather than oxide, the final burning being at a low red heat only.

[2] "Pharmacographia," p. 449.

The general conclusion come to from these results is that the trimming off the dark outside of the roots for the sake of improving their appearance is a custom which ought not to be countenanced, and that in judging of the quality of powdered rhubarb of commerce, the brightness of the colour or paleness of colour, which may indicate the absence of decayed roots, may also indicate low percentage of active constituents and a high percentage of oxalate of calcium.

Assay by Solvents contemplated.

At the time my first paper was read to the Newcastle Chemical Society (April, 1869), my aim was simply to throw light upon what I conceived to be a mistaken practice in trimming the roots and judging the quality of the powder by its colour; but from time to time the desirability of having some simple yet reliable means of judging of the medicinal quality of rhubarb forced itself upon me. The yield of extract appeared the most likely to give useful indications if a solvent could be fixed upon which would extract active matter and not inert mucilage; but from a little experience the examination looked too formidable and too delicate to be suggested to pharmacists for their trade purposes, but the experiments with several solvents afforded light which was interesting in another direction.

Oil in Commercial P. Rhubarb.

Ether, chloroform, benzene, etc., were found to extract from powdered rhubarb of pharmacy a yellow oily or unctuous matter. In 1878, operating with a solvent consisting of 8 vols. of chloroform to one of ether, I obtained from an ounce (437·5 gr.) of commercial powdered rhubarb by percolating about 1½ fluid ounces of the solvent, and, evaporating the percolate, 13 grains of yellow-brown oil (*i.e.*, nearly 3 per cent.), having a strong, disagreeable rhubarb odour.

Deodoration.

The marc, when dried and repowdered, was found to have considerably less of its natural odour, which to so many people is very offensive. My attention was thus diverted to the problem of depriving rhubarb of its offensive odour without diminishing its therapeutic value. The extract obtained by percolating with ether only was larger in quantity, and unctuous instead of oily. Having 21 grains of the chloroform-ether extract for experiment, I divided it into pills, and took on four successive days doses of 2, 4, 6, and 9 grains respectively, without any effect. As powdered

rhubarb taken in the same quantities would have been purgative, the deodoration of the rhubarb would evidently not make it less active. Experiments were multiplied and varied, having for their main object the removal of odour, but, at the same time, it was expected to get rid of the difficulty so often complained of in mixing compound rhubarb powder with water when required for taking. As the commercial powder examined at that date contained about 3 per cent. of oily matter soluble in chloroform-ether, and the unground root little more than a trace, I requested one of the well-known drug grinders to powder, without oil, roots of my own selection. The matter soluble in chloroform was thus reduced to a small amount, and the matter extracted by unmixed ether, which was considerably larger than that obtained by chloroform, was firmer, and contained resinous and astringent matters.

An ounce of powdered rhubarb (437·5 gr.), percolated with chloroform-ether solvent, yielded 7 grains of oily extract.

The first two ounces of percolate gave		.	5·0
The third ounce	„	„ .	1·4
The fourth ounce	„	„ .	0·3
The fifth ounce	„	„ .	0·3

the character of the residues becoming drier and less odorous as the process went on.

The similarity of the two last residues suggests that the point had been arrived at where the constituents freely soluble in this solvent had been extracted, and the matter still coming away was such as might be abundant in quantity, but was sparingly soluble, *i.e.*, about 0·3 in 600 grains of the solvent.

Deodoration in Bulk.

The powder thus treated was satisfactorily free from odour, and a bulk of 28 lbs. was treated in the same way in a percolator specially constructed of iron, with steam-jacketing and appliances attached to facilitate the recovery of the solvent. The deodorated rhubarb remaining in the pan of the percolator, after steam had been in the jacket for a number of hours, retained an odour of chloroform rather obstinately, which was ultimately removed by heating a day or two in the drying closet. The powder was then packed away in tins for use, and samples posted to one or two friends at a distance for their criticism, with the result that they pronounced them insufficiently deodorated to be a commercial success.

Redevelopment of Odour.

This judgment was disappointing, but was explained when I found that the rhubarb which satisfied me as it came from the last operation acquired an odour again when exposed to the air. A little of the dust on the top of one of the tins had absorbed moisture and become odorous, while the powder inside the tin was dry and almost free from smell. This observation was confirmed by similar observations on the percolator and other utensils, which had been left for some weeks with the deodorated rhubarb adhering to them, and, when wanted for another operation, were found to have a strong odour of rhubarb. Probably the action of air or absorption of moisture in transit by post developed the odour which my friends objected to. When the redevelopment of odour was fully confirmed, the process was abandoned as being insufficiently advantageous to warrant its adoption as a commercial matter.

The interest now attaching to it is simply the proof that rhubarb contains an odorous matter, capable of extraction by chloroform, etc., and that when this is removed, the rhubarb seems to have the power of again developing more by the action of air and moisture. Regarding the nature of the odorous principle, it would be premature to hazard a speculation. There is, perhaps, too much disposition to attribute the odours of vegetable substances to the presence of essential oils, and it was this disposition which led me to expect that the odour might be satisfactorily removed by chloroform, etc., and did not lead to the anticipation of a redevelopment of the smell.

Volatility of Odorous Matter.

During the experimental percolations the progress of extraction was observed by taking a drop of the percolate upon a micro-slip and evaporating; at first the residue was always unctuous and strongly odorous, and after heating a short while below 212° F. it continued to be unctuous, but ceased to be odorous, and after cooling the odour was not restored by air and moisture. Thus it appears that the odorous principle is volatile, and, if generated by the action of air and moisture as I suggest, it is the product of constituents of the root which are not extracted by chloroform.

Odorous Matter not very Volatile.

An experimental distillation of a sample of chloroform percolate, designed to test the practicability of recovering the solvent in a

condition pure enough to be used again and again for the same process, showed that the odorous principle was not *very* volatile. Eleven fluid drachms of the percolate put into a flask yielded about 10 fl. dr. of clean distillate, after which a few drops of yellow distillate collected in the tube condenser; these had a strong rhubarb odour. The flask cracked, and its contents were lost—not, however, without showing that the residue was more strongly odorous than the yellow drops of distillate, which no doubt contained chloroform.

Another portion of percolate, obtained when the rhubarb was nearly deodorated, was distilled, using water-bath heat instead of a spirit lamp. The distillate was clean, and the residue in the flask small, strongly odorous, and unctuous instead of oily.

Dragendorff's Analysis.

During the progress of these experiments on the fatty and odorous constituents of rhubarb, the analysis of this root by Dragendorff appeared in the *Pharmaceutical Journal* (April 20, 1878).

The following are the proximate constituents of rhubarb, according to this authority, with the percentages he obtained from a commercial sample of the Chinese root.

I have annexed four columns, showing the solubility of each in water, spirit, and benzol or chloroform.

The star indicates that the constituent against which it is placed is found in the matter extracted from rhubarb by the solvent heading the column. Its absence against oxalic acid indicates that water and spirit do not extract this acid from the root, though the acid is freely soluble in these solvents; the acid in the combination in which it exists in the root is not soluble in them.

I have not thought it necessary to quote the results Dragendorff obtained with the other four varieties of rhubarb; these will be found, by any one interested in the comparison, in the journal above cited; the most conspicuous difference in the five samples being the very large quantity of ash yielded by his sample of Rheum palmatum, that is 24·05 per cent., as against 6·32 per cent. in the China rhubarb, which he states contained practically the same quantity of oxalic acid.

Dragendorff on Ash and Oxalic Acid.

Dragendorff speaks of the ash obtained as "light grey"; but in the journal from which I quote, no further particulars are given

Constituents of Rhubarb as given by Dragendorff.	Per cent.	Soluble in Chloroform or Benzol.	Sol. in Rect. Sp.	Sol. in Sp. 30 O.P.	Sol. in Water.	Notes.
Moisture	8·69					
Ash	10·38		Part.	Part.	Part.	
Mucilage, soluble in water.	3·68				"	
Arabic acid, sol. in water, and not pptd. by alcohol.	2·01		?	?	"	Arabic acid, sol. in aq. when in combination with lime and other bases.
Metarabic Acid	8·17					
Pararabin	3·62					
Starch	11·95					
Cellulose	8·61					
Sugar	3·66		"	"	"	
A substance, sol. in aq. and alcohol	1·05		"	"	"	
Cathartic Acid	2·26			"	"	
Malic Acid	1·24		"	"	"	Malic acid, soluble if free or in combination with alkalies. Lime salt insoluble.
Oxalic Acid	2·15					Free oxalic acid, sol. in aq. or spirit, but being in combination with lime is not found in the aqueous or alcoholic extracts.
[1] Free Chrysophanic Acid	1·01	"	"	"		Free chrysophanic acid, almost insoluble in aq., more sol. in spir., especially hot, and freely sol. in chloroform and benzol.
[1] Chrysophan and Tannin	7·84		"	"	"	
Emodin, Erythroretin, Pheoretin and Brown resin	6·29		"	?		
White resin	2·75		?	?		
Fat	A trace	"	Part.			
Albumenoid Substances	3·92					
Paracellulose, Vasculose, Pectose, Lignin, etc.	10·72					

[1] The older chemists make no distinction between chrysophan and chrysophanic acid, and call it also by various other names—Rhein, Rheic acid, etc.—with the formula $C_{20}H_8O_6=C_{10}H_8O_3$ new numbers; Chrysophanic of the present day being Di-oxy-methyl-anthroquinone, $C_6H_3(OH):C_2O_2:C_6H_2Me(OH)$.

to throw light upon the great discrepancy in the yield from this sample—No. 3 in his series, and the yield from the others, viz., 8·27, 6·23, 3·2, and 10·38 respectively. Placing the ash and oxalic acid in juxtaposition, we have—

Numbers	1.	2.	3.	4.	5.
Ash .	8·27	6·23	21·05	3·20	10·38
Oxalic Acid	3·28	4·59	4·19	1·12	2·15

It is unsatisfactory to find that even this exceptional quantity of ash did not prompt the analyst to enlighten us regarding its composition. We might assume that he weighed the ash just as it resulted from a thorough burning off, in which case the calcium might be partly in the condition of oxide, but this would not accord with the small percentage of oxalic acid found. If it were weighed as carbonate, the carbonic acid it contained should have interfered with the beautiful concordance of his total percentages. As 56 of $CaO = 164$ oxalate of calcium ($CaC_2O_4 2Aq$)[1] or 100 of $CaCO_3$. If the 24 per cent. of ash contained 20 of CaO, that would equal 60 per cent. of oxalate of calcium in the root; and 46·00 of oxalic acid ($H_2C_2O_4 2Aq$) should have been found instead of 4·19, which Dragendorff obtained. If, on the other hand, we take his estimate of the oxalic acid, it equals 5·45 of oxalate of calcium, containing 1·81 of lime, and leaves 23·24 of ash to be accounted for—too much to be willingly passed over as potassium salts, and others natural to the root.

If, again, we suppose his ash was weighed as carbonate, which would accord with the wording of the paragraph on oxalic acid, say 22 of calcium carbonate equal 36 of oxalate containing 21·5 of oxalic acid, or about five times as much as he found. A more critical examination of his other statements, instead of enabling me to clear up this question, only detected further discrepancies. It would be unfair to condemn his results as untrustworthy, especially as I have only had the advantage of a translation and abridgment, and am unable to read the paper in its original language. It may be that many of the obscurities would vanish if the original account of his researches were under examination. Had the translation been under the critical correction of the author, some, at least, of the errors would have been eliminated, and I mention some of these now that the kind of errors I allude to may be understood.

[1] Oxalate of calcium is variously given as combined with 1, 2 or 3 Aq, the latter being the proportion in the raphides.

In No. 10, arabic acid, the figures 18·80 ought to read 18·08. In the table of results the fat in English rhubarb is given as 6·17, which ought no doubt to read 0·17. These in all probability are simply typographical errors, which a critical reader may correct for himself. But taking paragraph No. 14, pararabin and oxalate of calcium, sample "No. 1 gave 0·2143 gram of precipitate yielding 0·910 gram of $CaCO_3$=3·28 per cent. oxalic acid and 3·91 per cent. pararabin." The part of the precipitate being greater than the whole suggests that 0·910 should read 0·0910. To test this I desired to know if this quantity of $CaCO_3$ would equal 3·28 per cent. of the rhubarb, and I found the quantity of root under operation was not clearly defined. Tracing the quantity of root under analysis in paragraph 12, it is diffused in 100 c.c. of soda solution, and of which we are to take 50 c.c. "equal 2·5 gram of the root." In the next paragraph (13) the remaining 50 c.c. was diluted with water to 150 c.c., and "50 c.c.=1·64 gram of the root," taken for estimation of starch. But if the 50 c.c. really represents 2·5 gram of root and is made up to 150 c.c., and 50 of this taken, it is only one-third of 2·5, or 0·83, instead of 1·64 as stated. This leaves us in equal uncertainty as to the residue taken for paragraph 14, whether it represents 0·83 or 1·66 of the root.

Following out the figures given for the other samples under the estimation of oxalic acid, there is so much discordance as to give no hope of accepting the results, or founding any argument upon them.

Fractionation or Assay by Solvents.

Returning to the table of proximate constituents and their solubilities, a consideration of these suggested the analysis of rhubarb by a series of percolations.

Chloroform, to extract chrysophanic acid and fat.

Alcohol, to extract sugar, some salines, chrysophan, tannin, resins and emodin.

Spirit, 30 O.P., to extract cathartic acid.

Cold water, to extract mucilage and arabic acid.

Hot water, to extract starch.

Marc, after this treatment, to be regarded as tissues, insoluble gum and oxalate of lime.

A tentative experiment upon commercial powdered rhubarb proved that percolation with weak spirit was difficult and with water was impracticable. The experiment was persevered in after it was found that the loss involved would render valueless all

those results following the strong spirit extract. The numbers subjoined are reliable for the first five constituents only.

Fractional extraction of rhubarb by successive solvents:—

Moisture	7·00
Extracted by petroleum spirit	1·20
„ „ chloroform	0·14
„ „ dry ether	0·30
„ „ dried spirit	31·10
„ „ spirit 1, water 1	10·20
„ „ cold water	2·60
„ „ hot water	3·20
Marc	15·00
Loss	29·26

A repetition of this experiment, with more care to avoid loss, and some modification of the method, still proved troublesome; and though the loss was reduced to 5·45 per cent., the general result did not promise any practical use.

As a further simplification, 100 grains of commercial fine powdered rhubarb percolated with—

Rectified spirit gave	46·20
Proof spirit	10·60
Leaving marc	43·15
	99·95

The method adopted to reduce the loss to the smallest possible amount was to use a percolator in which the marc could be conveniently dried without removal. The percolator consisted of a small cylinder of tin plate tied over at one end with filtering paper and muslin; this cylinder fitted within a glass cylinder with very little intervening space; the inner one, when allowed to fall to the bottom of the glass, permitted maceration to go on any length of time, and on being lifted up and fixed by a wedge of cork forced between the two cylinders, percolation went on.

The rhubarb having been macerated in an ounce of rectified spirit for two days with frequent shaking, then the percolation started, and continued with more spirit, till ten fluid drachms had come through.

This percolate on evaporation left	42·7
The next 3 drachms „	2·1
The following 3 drachms „	1·1
	46·2
The marc dried in the percolator =	52·5
	98·7

The marc having been subject to the action of strong spirit only was not difficult to powder, and was returned to the percolator and treated in a similar way with proof spirit, two days' maceration in an ounce of the solvent being allowed before the percolation was started.

The first 10 fluid drachms gave . .	7·75
The next 6 drachms	2·30
The last 6 drachms	0·55
	10·60
The marc again dried in percolator =	43·15
	53·75

showing an apparent gain of 1·2 over the first stage of the experiment.

Adopting the same method of percolating, and a coarser comminution obtained by rasping the root, it was found practicable to continue the percolation with a series of solvents, including cold and hot water.

Mr. Holmes' Root. May, 1892.

A sample of root was kindly supplied to me by Mr. Holmes, from the Pharmaceutical Society's Museum. It had a reticulated surface, and was considered a good sample of commercial Chinese rhubarb, solid and heavy.

Interior and exterior portions were taken for comparison, and the solvents used were strong methylated spirit till nearly exhausted; then a mixture of two vols. of the same spirit with one vol. of water; third, one vol. of spirit and two of water; fourth, cold water; and in one experiment it was continued with hot-water maceration and hot percolation. In each case the action of the solvents was fractionated, and continued till 600 or 800 grains of percolate left less than a grain of extract, at which point it was considered that practical exhaustion had been accomplished.

The following results were obtained:—

	Exterior.	Interior.
Strong spirit	39·00	42·70
Spirit 2, water 1 . . .	8·60	5·05
Spirit 1, water 2 . . .	1·36	1·00
Cold water	0·60	0·90
	49·56	49·65

showing a remarkably close correspondence between the exterior and interior portions of this root, showing how little matter is extracted by cold water after spirit has been exhaustively applied,

and showing very little prospect of any sharp separation or estimation of the proximate constituents by the use of a series of solvents.

Excepting starch, organized tissues, and raphides, the constituents of the root are probably best considered as soluble in all the above solvents, but that some are more freely soluble in water and some in spirit, but none actually insoluble in either.

One sample, after exhaustion by the above series of cold solvents, was found to yield 6·25 per cent. more on maceration and percolation with hot water. This probably represents the starch, and corresponds very closely with the starch which Dragendorff found in Chinese rhubarb, namely, 6·20 per cent.

Influence of Fineness of Comminution.

To test the comparative proportion of extract yielded to spirit by a powder obtained by simple trituration in a mortar, with a finer powder obtained by trituration with pumice stone, the following experiment was tried:—

Parcel of Untrimmed Chinese Root, per Mr. Holmes. Jan., 1893.

One hundred grains from the exterior of one of Mr. Holmes' roots was dried and rubbed in a mortar till a good hand-made powder was obtained, though still palpably rougher than the commercial fine powder.

Thirty grains of this macerated in strong spirit on the percolator 24 hours, and then percolated.

		Per cent.
First f. ʒiij. percolate gave extract . .	8·7	29·0
Second (after another 24 hours' maceration)	1·4	4·7
Third ʒv. (after 2 days' maceration) . .	0·4	1·3
Fourth ʒv. (after 1 day's maceration) . .	0·3	1·0
	10·8	36·0

Thirty grains of the same powder mixed with 30 grains of pumice stone, and submitted to further rubbing till very smooth, was macerated and percolated in the same manner. The quantity of spirit put on the powder was greater, to compensate for the bulk given by the addition of the pumice, and, as it proved, greater than was necessary for this compensation, the yields being greater in bulk, but otherwise comparable.

		Per cent.
[1] First ʒvi. gave extract . . .	9·5	31·7
Second ʒiv. „ „ . . .	1·4	2·7
Third ʒvi. „ „ . . .	0·5	1·7
Fourth ʒvi. „ „ . . .	0·2	0·7
	11·6	36·8

[1] Referred to on page 521.

The result showed a slightly increased yield, and a more rapid approach to exhaustion as a result of the finer comminution.

The fat, chrysophanic acid, etc., yielded to chloroform by this specimen = 0·5 per cent. of pale yellow colour.

Fat.

One hundred grains of the interior of the same root, which was rather spongy and more easily reduced to powder, treated without pumice, gave fat, etc., 0·66 per cent. pale yellow, and by maceration and percolation with strong spirit.

			Per cent.
30 grains. First percolate (3x.) gave extract	11·7	39·0
Second „ (3vi.) „ „ .	1·1	3·7
Third „ (3iij.) „ „ .	0·2	0·7
	13·0	43·4

In this case the spongy interior yielded rather more fatty matters and more extract than the exterior. The relative proportion of extract now obtained from the central and cortical parts of the same root are just the converse of the proportions obtained in my first experiments quoted in the early part of the paper.

Oil in Rhubarb.

Reverting again to the oil in commercial rhubarb, the case quoted above,—

	Per cent. Oil.
In 1878 a good commercial powder yielded .	3·0
„ specially ground by Allen . . .	1·6
May, 1881, Commercial powder . . .	0·5
June, 1886 „ „ . . .	1·0
Average .	1·5
Feb., 1888, Hand-made powder . . .	Trace.

In March, 1892, a series of commercial samples of the powder obtained from various wholesale firms, all of high standing, were examined for matters soluble in chloroform, which consisted almost entirely of oil or fatty matter with a yellow colour. In each case 100 grains of the powder packed in a percolator was treated with chloroform till a drop of the percolate, when evaporated on a glass slip, left a residue, which by comparison with a scale of residues was judged to be less than 0·0001 grain. The total clear percolates on evaporation yielded respectively:—

No. 1	2·2
„ 2	1·4
„ 3	1·3
„ 4	2·2
„ 5	0·2 [1]
„ 6	0·9
„ 7	0·5
„ 8	0·4
„ 9	— [2]
„ 10	1·0
„ 11	1·0

Average 1·2 per cent. in commercial samples.

Up to the date of this table (1892) the almost total absence of oil in the unpowdered roots that I had examined, and the appreciable quantity in the powdered rhubarb of pharmacy, struck me as the one point readily ascertainable by the pharmacist and worthy of his attention. The addition of a little oil in the grinding is scarcely an adulteration, for the quantity is so small as not to be directly profitable; but the fact of its facilitating the production of a smooth powder, and a bright colour, may give the unwary an impression that the oily powders are of a finer quality than those which are free from it. The presence of turmeric in powdered rhubarb, which has at various times been spoken of, would be detected by the intense yellow which it imparts to chloroform (also benzene, ether, etc.); but I have never found it, and I do not anticipate its being found in the rhubarb of pharmacy.

Chrysophanic Acid.

The yellow colour extracted by chloroform, etc., is probably chiefly chrysophanic acid, which appears to exist in rhubarb in quantities varying from a trace upward.[3] In speaking thus of chrysophanic acid, I use the term in the somewhat loose and ill-defined way which has been customary, and I am not prepared to say that the colouring matter put down as chrysophanic acid is really di-oxy-methyl-anthraquinone, as now defined to be the true acid. The commercial acid (probably only chrysarobin of the B.P.) dissolves in ether and petroleum spirit, and more freely in chloroform and benzol. The colour may be shaken out from the petroleum solution with solution of ammonia, and the pink

[1] This was a home-made powder for comparison.

[2] This was oily, but as its source was not known, it was not considered worth a careful estimation.

[3] Dragendorff says up to about 1 per cent. *Ph. J.*, April 20th, 1878.

ammoniacal liquor on evaporation to dryness leaves a pink residue not turned yellow by acetic acid, but yielding this colour when treated with HCl.

For the sake of comparing the reactions of the yellow matter of rhubarb with those of chrysophanic acid or chrysarobin, 100 grains of commercial powdered rhubarb were percolated with benzol, yielding a yellow percolate; percolation being alternated with 12 to 24 hours' maceration, exhaustion was fairly complete in about a week by the use of 500 or 600 grains of benzol, the latter portions being almost colourless. A portion of the yellow percolate shaken with ammonia water in a separator yielded a pink aqueous solution; but when by many repetitions of the ammoniacal washings the aqueous liquors ceased to extract pink colour, the benzine still retained some yellow matter. As chrysophanic acid and chrysarobin are both soluble in benzol, and only the former in ammoniacal water, the yellow colour not washed out was supposed to be of the nature of chrysarobin; it was therefore treated with caustic potash and water, and exposed to the air in a warm place to permit oxidation and evaporation. The red residue thus left did not entirely dissolve in water, but yielded a red solution which on being acidulated with HCl turned yellow. This on shaking with benzol yielded up its yellow, leaving the watery liquor nearly colourless, confirming the analogy between the benzol extract and chrysarobin, which by similar treatment with KO oxidizes into chrysophanic acid.[1]

Formation of Chrysophanic Acid by Action of Air, Water, and KO.

The next question was whether the rhubarb which had been exhausted by benzol still retained any constituent which was capable of undergoing oxidation in the presence of water and caustic potash and yielding chrysophanic acid.

To test this, the marc of the benzol percolate was dried, and mixed with its own weight of B.P. Liquor Potassæ, and about three times as much water, and left exposed to the air for a week, during which it became a horny brown cake. This softened with water and rubbed with 200 grains of sand, again dried, powdered and percolated with benzol, when it yielded a *much richer* yellow percolate than the original rhubarb. This percolate yielded to solution of ammonia much richer pink solutions, and after six washings the

[1] Chrysarobin oxidized becomes chrysophanic acid. $C_{30}H_{22}O_7 + 4O = 2C_{15}H_{10}O_4 + 3H_2O$. Watts' *Dictionary of Chemistry*.

benzol was nearly colourless. The reactions of the pink ammoniacal liquor corresponded to those of chrysophanic acid, that is, the solution evaporated left a pink residue retaining some of its pink tint in acetic acid, and becoming decidedly pink again on evaporating the acetic solution to dryness. With H Cl it became purely yellow, and the residue on evaporation, when treated with strong nitric acid, gave a full yellow solution, fading after a few hours, and with strong sulphuric acid a rich red solution, also losing its colour in the course of an hour or so. This probably sufficiently answers the query which has so long remained on our Blue List, as to whether rhubarb contains chrysophanic acid, or only matters capable of yielding it by their oxidation. The chrysophanic acid is usually present in very evident traces, and the matters capable of yielding it by oxidation are present in much more copious quantity.

Oil Natural to the Root.

The oil found in small quantity in various samples of unpowdered commercial roots, and in larger quantity in various samples of powder supplied to me by the grinders with the assurance that no oil was used in the grinding process, suggested the desirability of obtaining a sample of root as taken out of the earth by the grower; but before applying for such, I thought it desirable to make a few further experiments upon the commercial product.

With this view I selected three pieces of root from the parcel of Chinese rhubarb which Mr. Holmes had procured for me, taking large, medium, and small pieces, in case results were influenced by the growth of the root; powders were prepared from the interior and exterior of each, the interior samples being obtained by boring with a small auger, and the exterior by paring off the outside. After drying and powdering in a porcelain mortar, 10 grains of each were treated for fat by being macerated in about 200 grains of chloroform for a day or more, thrown upon a filter, and a little more chloroform passed through. The following results were obtained:—

	Fat per cent.	Ash per cent.
Large interior . . .	0·5	5·0
„ exterior . . .	0·5	5·3
Medium interior . . .	0·5	10·0
„ exterior . . .	1·0	10·5
Small interior	0·5	5·4
„ exterior . . .	1·0	5·0

I have not attempted to separate the chrysophanic acid from the

fat here indicated, and it must be remembered that it may constitute a considerable proportion of it. The colour and consistence being the guide, there was evidently enough to give a pretty strong yellow colour in all cases, and in none was there so much as to detract from the soft, unctuous condition, and in no instance did the residue take the condition of fluid oil, as was the case in various of the commercial powders.

Ash Soluble and Insoluble.

The three samples of ash obtained from the exteriors were examined for their degree of solubility.

	Soluble.	Insoluble.
The 5·3 yielded . . .	2·3	3·0
10·5 „ . . .	3·0	7·5
5·0 „ . . .	1·5	3·5

During the powdering of these samples (of root) the mortar became coated with a thin covering of orange-brown matter, suggestive of resinous or unctuous constituents. Being very thin, and firmly adherent to the mortar, it was difficult of removal even by rubbing a fine, silicious sand in the mortar, until aided by the addition of a little chloroform. When this had detached the film and diffused it through the sand, the rubbing was continued till the sand was dry. This sand, percolated with chloroform, yielded 0·05 fat, and on incineration lost 1·25, from which it appears that the matter adhering to the mortar contained about 4 per cent. of fat, while the average percentage of fat in the roots powdered was only 0·66. It must also be noted that the *lowest* yield now quoted is more than that previously obtained from the home-made powder ; viz., 0·2.

Raphides.

In view of the familiar statement that the raphides of rhubarb consist of oxalate of calcium, and that this salt is soluble in hydrochloric acid, some of my observations seemed contradictory, and a further experiment was tried : 100 grains of powdered rhubarb macerated in a mixture of methylated spirit and hydrochloric acid, spirit being used in preference to water because of its facilitating the subsequent percolation, which was continued till the bulk of the soluble matters were removed, presumably including the calcium as chloride, and oxalic acid. The solution evaporated and incinerated only left ash equal to 2 per cent. of the root, while the marc still left a considerable ash on incineration of a small portion.

Pure strong hydrochloric acid was then poured upon the marc, and allowed to macerate before the percolation was continued. By this treatment the percolate still contained little ash and the marc much. The persistence of a considerable ash in the marc suggested that the raphides were much more difficult of solution than oxalate of calcium is generally supposed to be, and the possibility that in Dragendorff's analysis the operation for oxalic acid had been imperfectly successful. In his operation (14) he treats the marc of a previous operation with dilute hydrochloric acid containing 1 per cent. of H Cl. This was macerated twenty-four hours, and then rapidly boiled. The solution was supposed to contain all the oxalic acid and lime, and when saturated (*sic*) with ammonia, to give a precipitate indicating the quantity of oxalic acid in the root.

Calcium Oxalate.

Calcium oxalate is not freely soluble in dilute hydrochloric acid, but dissolves more copiously in the strong acid aided by heat. Either solution deposits crystals of oxalic acid, as the bulk is reduced by evaporation; and when evaporated to dryness, calcium oxalate is left with very little Ca Cl. Some of the oxalic acid is lost (as C O and $C O_2$?), the washings of the residual oxalate yielding a small precipitate with ammonia, indicating that they contain both lime and oxalic acid; and after filtration the ammoniacal mother liquor gives a further small precipitate on the addition of oxalic acid, showing that the oxalic acid had ceased to exist in its normal proportion in the residue. To test the solubility of calcium oxalate in 1 per cent. solution of H Cl, 100 grains of pure hydrochloric acid (=32 gr. H Cl) with 7 fluid ounces of water dissolved 12 grains of precipitated carbonate of calcium, and to this was added 16 grains of oxalic acid, dissolved in water. There was thus brought together the elements of a 1 per cent. hydrochloric acid, with an excess of calcium oxalate, under circumstances most favourable to the solution of the latter. A fine crystalline precipitate gradually formed, which, after twenty-four hours, was collected, washed, and weighed 9·7 grains, with a dead white appearance, but transparent under the microscope. The total oxalate of calcium theoretically present should be between 15 and 20 grains, according to its degree of hydration, which varies according to the circumstances of the precipitation. The mother liquor, on standing another day, deposited a further trace of precipitate. It was then rendered alkaline with ammonia, and,

after standing a day, the precipitate collected, washed, and weighed 6·1 grains.

Four grains of calcium oxalate (weighed from the above 9·7 gr.) macerated for twenty-four hours in fl. ℥i. of 1 per cent. hydrochloric acid, quickly boiled, kept hot for ten minutes, and boiled again, filtered hot; the filtrate, on cooling (=fl. ℥vii.), deposited 1·5 gr. crystals. The undissolved oxalate=1·9, and the mother liquor precipitated with ammon. 0·8. This shows a solubility of the oxalate in 174 parts of hot dilute hydrochloric acid, and in 478 parts of the same at 60° F.

If Dragendorff's statement is to be understood as "50 c.c. of a mixture containing rhubarb, made up to 100 c.c. by the addition of 1 per cent. solution of H Cl," his solvent is only half the above strength. But this question I will not further debate, but I think any one meeting with a sample of rhubarb with an abnormally large proportion of ash should not miss the opportunity of determining the acids and bases it contains, and the proportions of those which are present in large quantity.

Prof. Balfour's Samples. Fresh Roots of Rheum Palmatum and Tanguticum.

By the favour of Prof. Balfour, I recently received two roots of Rheum palmatum from the Botanical Gardens at Edinburgh. One was rather a young root of the ordinary kind, and the other a much older root of the variety Tanguticum; both had the leaves attached and the garden soil in which they had grown. Samples were cut off sufficient for my examination, brushed under running water to remove the soil, and superficially dried.

A portion of the younger root, about 2 inches long by 1·2 diameter, was cut off, and again divided into two cylinders of an inch each, one dried entire, the other divided into three parts, a cortical, a central, and an intermediate zone, and dried after this dissection.

The treatment adopted for these and the following samples was to dry, powder, exhaust with chloroform for fat and chrysophanic acid, then exhaust with strong methylated spirit for alcoholic extract, then with water for mucilaginous extract, then to dry and weigh the marc, then to burn off the marc for ash, which, after weighing, was treated with water and weighed again.

The results obtained for Rheum palmatum, dried after dissection, were as follows:—

Ten grains of powder.	Internal section.	External.
Extracted by chloroform .	0·15	0·15
„ strong spirit .	3·50	3·40
„ water . .	1·00	1·10
Marc	5·20	4·85
	9·85	9·50
Ash, from marc . . .	0·60	0·33
Consisting of soluble . .	0·10	0·03
„ insoluble . .	0·50	0·30

The counterpart of these, dried before dissection, gave :—

Extracted by chloroform .	0·15	0·15
„ strong spirit .	4·55	4·30
„ water . .	0·75	0·30
Marc	5·00	5·45

I give these latter figures as I obtained them, but with the feeling that there is nothing clearly to be deduced from them.

A slice from the large root of R. Tanguticum divided into internal and external portions before drying :—

Ten grains of powder	Internal.	External.
Extracted by chloroform .	0·15	0·13
„ strong spirit .	5·35	3·45
„ water . .	0·60	0·70
Marc	4·47	5·00
	10·57	9·28
Ash, soluble	0·05	
„ insol.	0·10	
„ total	0·15	
„ soluble	. .	0·10
„ insol.	. .	0·10
„ total	. .	0·50

In these two specimens the chloroform extract was much more intense yellow colour; the internal unctuous and the external nearly dry, probably great part chrysophanic acid.

Fat.

Tabulating the results as regards fat obtained from home-made powder in comparison with that yielded by commercial powders, we find :—

	Fat.
Early samples of com. powders average .	1·5
Samples collected in 1892 „ „ . .	1·2
Home-made powders, traces, up to . .	0·2

Recent experiments, home-made powder, commercial root:—

	Cortical.	Central.
Sample, page 512 . . .	0·5	0·66
„ „ 516 . . .	0·5	0·50
„ „ 516 . . .	1·0	0·50
„ „ 516 . . .	1·0	0·50
Average	0·75	0·54

These figures suggest an improvement in the trade powder since the date 1878, when 3 per cent. was found. They also suggest the possibility of the commercial roots being rubbed with oil to improve their appearance, a possibility the truth of which it would be difficult to investigate in a drug imported from a dark empire, but which forced upon me the desire to obtain roots direct from the soil. The samples received from Prof. Balfour enable me definitely to say that fatty matter is natural to the root, and suggest that the fat preponderates in the infantile roots and the chrysophanic acid in those which have arrived at old age.

Several of the residues tabulated above as fat or oil were subjected to the action of solution of ammonia, yielding a pink solution, and leaving a yellowish-red residue, which, on treatment with liquor potassæ, yielded more pink solution, but, even when aided by heat, a brown residue remained, varying in quantity and quality with the various samples, that from R. Tanguticum being very small and very little fatty in its nature, that from the young root of R. Palmatum being oily and with little colour. Rectified spirit has but little action upon the fat, but the solvent action of ether, chloroform, and benzol is rapid and complete.

Ash.

Gathering into tabular form sundry figures scattered through the preceding pages, we find:—

	Ash in Cortical.	In Central.
Sample, page 501 . . .	9·6	—
„ „ 501 . . .	—	14·8
„ „ 516 . . .	5·3	5·0
„ „ 516 . . .	10·5	10·0
„ „ 516 . . .	5·0	5·1
Average	7·6	8·8
Marc, page 501 . . .	5·1	12·0
„ „ 520	3·3	6·0
Average	4·3	9·0

On an average there is more ash in the central part of the root

than in the cortical, though the excess is only small. But in the marcs of the two parts respectively, the central part contains a large excess of ash. No doubt the raphides abound in the central parts and the soluble salts in the outer parts of the root, the latter probably migrating towards the surface in the process of drying.

Pharmaceutical Tinctures.

Viewed pharmaceutically, a consideration of the constituents and their solubilities suggests that a tincture prepared with strong spirit would contain the chrysophan and tannin, which, from their antiseptic action, are believed to give rhubarb its value in diarrhœa, and accompanied by little or no cathartic acid, upon which its purgative action depends.

A tincture prepared with weaker spirit from the marc of the strong tincture should have the purgative property with little of the astringency of the official tincture, the tannin and chrysophan having been removed by the first operation.

A proof spirit tincture made direct from the natural powder should contain all that is active, both purgative and astringent, in the root.

An extract prepared by distilling off the spirit from this proof spirit tincture would possess rather more medicinal value than the official extract, from the exclusion of inert gum, and is found to be free from the intractible toughness which is imparted by the presence of mucilaginous bodies.

P. Rhubarb Exhausted with 30 O.P. Spirit is Inert.

It was not found difficult to percolate the fine commercial powdered rhubarb with spirit 30 over proof, though the process was slower than with rectified spirit. Half an ounce (219 gr.) of the powder macerated in the spirit for a day, transferred to a percolator, was exhausted by the time 2 ounces of percolate had passed. The marc, when dried, weighed 108 grains. It had the colour of jalap, was nearly tasteless, and without medicinal effect in doses of 40 grains.

Weaker Spirit, Weaker Extract.

Half an ounce of the same powder, treated in the same way with proof spirit, aided by the use of a pressure percolator,[1] gave a larger yield of extractive matter, the marc being reduced to 94 grains,

[1] The form described in Proctor's "Practical Pharmacy" for the assay of opium, etc.

the extract being 116·5 gr. (water and loss 8·5). If the stronger spirit leaves the marc *devoid of active matter*, as accords with my experience, the extract obtained by weaker spirit, being larger in quantity, must be poorer in quality. Exhaustion was effected in this case also by the time 2 fluid ounces of percolate were obtained, and the latter portion of the percolate had comparatively little taste and contained little solid matter, the first 12 drachms yielding 106 gr. extract, and the subsequent 4 drachms only 10 gr.

The solubility of the cathartic acid is such as permits its extraction by spirit about 30 over proof, but that is about the extreme strength available.

Weaker spirit is not available for percolating a fine powder, and a coarse powder is more difficult of exhaustion.

Syrup of Rhubarb.

The use of weak spirit and a coarse powder, as ordered for the B.P. syrup, has the disadvantage of dissolving some matter which imparts to the syrup a tendency to ferment. In "Practical Pharmacy," I have recommended the use of a strong tincture of rhubarb, added to simple syrup, as an improvement upon the official formula. The suggestion there made is to use a tincture prepared with rectified spirit. This is a mistake which has been overlooked—proof spirit, or spirit 20 to 30 over proof, should be the reading, as rectified spirit is too strong for the extraction of cathartic acid. The proportion of rhubarb in my formula is less than the official, but on the other hand the exhaustion of a fine powder is more complete, and the resulting medicinal strength of the product is probably equally great. If it were desired to retain the present ratio between the root used and the syrup yielded, I should prefer that the extraction should be effected by the use of spirit over proof and recovering the same by distillation.

Problems requiring clearing up are still numerous. Dr. O. Hesse promises an inquiry into the nature of chrysophanic acid of rhubarb in comparison with acid bearing the same name from other sources. If he extends his investigation to cathartic acid, which is probably no less variable according to the sources of supply, and to other constituents of rhubarb credited with medicinal value, his work will be a boon to pharmacy.

Whether the oxalic acid of the root is always proportionate to the lime found in the ash is at present questionable; and though perhaps of no great importance to the pharmacist, it is a matter of scientific interest.

The influence of maturity of the root at gathering, and the influence of long keeping after collection, upon the quantity of fat and chrysophanic acid, is another query which arises out of the above work.

Were it not that art is long and time is fleeting, I might have hoped to clear up some of these points more fully; but as my twilight is approaching, I can only invite others to take up the work where I lay down my tools.

GENERAL BUSINESS.

The Formulary Committee.

Mr. LLOYD WILLIAMS then moved that the members of the Formulary Committee, who had conducted their work in a very able manner during the past year, be re-elected. He was quite sure that in their hands the interests of pharmacy would be perfectly safe, and they had to thank them very heartily for what they had done.

Mr. LINFORD, in seconding the nomination, said the action of the Committee had been of such really practical use to chemists and druggists that next, perhaps, to the Pharmaceutical Society they owed as much to the Formulary Committee as to anybody else.

The resolution was carried unanimously.

Mr. MARTINDALE, on behalf of himself and his colleagues, thanked the meeting for the honour of re-election. He said there was still work to do, and a new edition of the Formulary would be ready in a week or so.

Place of Meeting for 1895.

Mr. BRIDGE, of Bournemouth, said it was with very great pleasure, but with a great amount of trepidation, that he came forward to offer a unanimous invitation to the Conference to visit Bournemouth. They could not offer anything like that hall, nor anything like Oxford, and the only excuse for going there after Oxford was that there was no other Oxford. They were about as young as Oxford was old, but still they were vigorous, and vigorous infants were sometimes interesting. He could assure them the invitation was unanimous; they had several meetings to consider the point, and at the local association there was not a voice raised against it; and whatever Oxford or any other town had given the

Conference, if they would accept their invitation for 1895, he could safely say that no city or town would ever have exceeded the welcome they would give them.

Mr. TOONE said he should like to add just one word in support of the invitation Mr. Bridge, who was president of the local society, had given. He had said very truly that they had nothing to show like those grand historic buildings which they had looked at with so much delight during the last two or three days. Bournemouth was a new town, though as far as population went it was as large as Oxford, and there were some rude people who, speaking of their growth, compared it with one of the edible fungi; but for all that, although they might have grown rapidly in the past, they had a large, important, and beautiful town at the present moment, and they believed they had a very great future before them. There was one pharmacy in the town which had over its door the legend "Established in 1844," and they always passed that gentleman's abode with veneration, and looked on him as one of the links with the prehistoric past. He could assure the Conference that they would do their utmost to make the visit a pleasant one. Nature had endowed them with beautiful gardens, with forest trees, and that which was such a charm in the summer time for those who lived in big cities—a beautiful sea.

Mr. GERRARD proposed that the kind and hearty invitation to the Conference by the representatives of Bournemouth be accepted. Mr. Bridge had said there was no other Oxford, and he might say there was no other Bournemouth. He had seen and learnt something of the rise of Bournemouth, and there was no doubt that it was a beautiful child which they would all like to go and see. Even those who had been before would like to go again, and he might say that they would have something of the old as well as the new. There was Christchurch Abbey, and Wimborne was not far off. He had spent many happy days in the district of the beautiful New Forest, which was very near with its botanical riches, and he hoped that the ladies now present and many others would also meet them at Bournemouth.

Mr. WARD (Leeds) seconded the proposal. They had had some reference made to the contrast between the antiquity of Oxford and the youthful vigour of Bournemouth, and it might be well for the Conference to renew some of the vigour of its youth by going to see this beautiful strong infant which had been described.

The PRESIDENT said their friends from Bournemouth would pardon him for saying one word about this new departure before putting

the motion to the meeting and heartily supporting it. This year they had not an invitation from the town where the British Association was to meet, but a great deal of misapprehension had gone abroad with regard to the Pharmaceutical Conference, and he hoped they would bear with him if he brushed aside some newspaper paragraphs, the result of gossip which was quite wrong, and he was quite sure would deter small communities from the pleasure which they would have in receiving the Conference. The Conference did not require, as the British Association did, a guarantee fund; it did not require that the locality should spend a great deal of money in entertaining it, although if men possessed money why should they not spend it in entertaining their friends? If he went to visit a lord, and the lord chose to entertain him in a manner suitable to his position, he did not complain; and if he went to visit a peasant, and that peasant entertained him in the position in which he lived, he did not complain either, but he enjoyed the hospitality of the peasant as he enjoyed that of the lord. That was the true English spirit of hospitality. He was not reflecting on their friends at Ipswich, who had been deterred, no doubt, by these things from sending an invitation to enter into rivalry with their friends at Bournemouth, but what the Conference required in any town to which it went was simply that which a few local people could do, but what no president and no executive committee could do: obtain information about the locality, the halls accessible, and the arrangements to be made—the various little things which a host did for his friends, but those little things need not entail more than a fraction of expense. He put that plainly, and he hoped it would brush aside any misapprehension with regard to the future of the Conference, and enable the smallest village which has hotel or lodging accommodation for 200 or 500 people, because he hoped the numbers would rapidly increase, and that one thing must be considered; but any community which could entertain the British Association, which required a guarantee fund of something like £2,000 and sent a number of members, varying from 1,500 to 2,500, into its neighbourhood for ten days, could entertain the Conference. It was a mere bagatelle. Whether it took place at the same time was a different point, and that difficulty had been solved on the present occasion. Their friends at Bournemouth would forgive him for saying that, because in the best interests of the Conference he thought it his duty to do so, but he had the greatest pleasure in supporting the motion. If he were not

President at Oxford and he had the choice he should like to be President when the Conference went to Bournemouth, for through the kindness of one of the past presidents he had the opportunity of spending a few days there, and he could assure them it was a most beautiful place, and if they could only have the meeting when the rhododendrons were in bloom, they would see a sight which would make them love their native country, and renew all their early affections for the beautiful scenery of England; but he had not the slightest doubt, from what he saw in February, that at any time of the year it was a beautiful place, and he was perfectly sure they would be welcome there, whether the meeting was in the summer or in winter.

The motion was put and carried unanimously.

Mr. BRIDGE returned his hearty thanks for the compliment which had been paid to Bournemouth. If all the nomination slips were returned to head-quarters they would have a fairly warm time, but he did not wish to prevent them doing so, because the more they were the merrier they would be, and Bournemouth was big enough for them all, and a great many more.

Presentation from the Bell and Hills' Fund.

The PRESIDENT said he could not open the business which had yet to come without making allusion to the illustrated handbook published by the editor of the *Pharmaceutical Journal*. It had already been very highly spoken of by the Mayor and others, and it was only right to take notice of it. This book was published in the hope of "further cementing the bonds which unite the British Pharmaceutical Conference with the Pharmaceutical Society of Great Britain and its official organ." Everybody knew that the connection of the Pharmaceutical Society with the Conference was not one that affected the Society in its executive or legal work, but merely arose from the fact that the founders or leaders of the Society were the founders of the Conference, and had from the first almost been the leaders of it. The Journal had for many years published *in extenso* the whole proceedings of the Conference earlier than they could possibly get out the *Year-Book*, and this was of very great value. The Executive had unanimously passed a resolution thanking the editor for his contribution on this occasion, and he personally desired to compliment him on the way in which he had done the work. The members were requested to preserve the handbook, with the exception of a portion of one page, which was intended to be used as a nomination form for new members, and he

hoped within a few weeks that the whole of those slips would be returned with names upon them, the owners of which the Executive would be delighted to elect. With regard to the Bell and Hills' Fund, he was not very well posted in the history of the matter, but he had the honour of receiving the books at Newcastle, and remembered that owing to the munificence of Mr. Hills a present of books was made to the local pharmaceutical association wherever the Conference went. There was no association at Oxford at present, and as it was a condition of this presentation that the books must be put where they could be accessible to chemists and druggists of the district for reference, and as the necessary information had not been supplied in time, the books had not been brought. Nevertheless, the presentation would be made in due course, the books would be sent to Oxford, and stored in a suitable place where they would be available.

Mr. DRUCE said the books would be placed in the Public Library of the city under special care; they would not be lent out, but would always be on the shelves for reference by pharmaceutical students and others, until a local pharmaceutical society was formed, and they would then be handed over by the committee of which he was a member to that society.

ELECTION OF OFFICERS.

The following officers were unanimously elected for the ensuing year:—

President:—N. H. Martin, F.L.S., F.R.M.S., Newcastle-on-Tyne.

Vice-Presidents:—Michael Carteighe, F.I.C., F.C.S., London; J. Laidlaw Ewing, Edinburgh; W. Hayes, Dublin; J. A. Toone, Bournemouth.

Treasurer:—John Moss, F.I.C., F.C.S., London.

Hon. General Secretaries:—W. A. H. Naylor, F.I.C., F.C.S., London; F. Ransom, F.C.S., Hitchin.

Hon. Local Secretary:—Stewart Hardwick, Bournemouth.

Other Members of the Executive Committee:—F. C. J. Bird, London; Peter Boa, Edinburgh; G. E. Bridge, Bournemouth; E. H. Farr, Uckfield; J. Hodgkin, F.I.C., F.C.S., London; E. M. Holmes, F.L.S., London; Henry Mathews, Oxford; W. F. Wells, Dublin; R. Wright, F.C.S., Buxton.

Auditors:—W. Clayton, Oxford; F. Spinney, Bournemouth.

Votes of Thanks.

Mr. Groves moved,—

"That the hearty thanks of the meeting be given to the governing body of Christ Church for the use of the hall for the purpose of the reception by the President of the Pharmaceutical Conference."

They must have all felt what a pleasure it was to visit that noble hall, and to have an opportunity of inspecting the various portraits which adorned it. It answered their purpose admirably, and they were all pleased to spend an evening there. Their thanks were rightly due to the authorities, and he might specially refer to Canon Ince for his address of welcome, and those who kindly provided the objects of interest.

Mr. Jones seconded the motion.

The President, in putting it, said it was a work of entire supererogation to commend the motion to the meeting, but he must say that the warm reception given them by Canon Ince must have been very pleasurable to every one.

The resolution was carried by acclamation.

Mr. Carteighe moved,—

"That the best thanks of the Conference be given to the Warden and Fellows of New College for the permission to hold the afternoon at home in their gardens."

The observations one had to make with reference to these votes of thanks were necessarily much the same at every meeting of the Conference, but there was something special on this occasion, inasmuch as a number of their brethren had seen what he had known for a long time personally, that this great city, the heads of its colleges, and the officers associated with it, and its professors, whether in medicine, science, or divinity, were sympathetic with pharmacy.

Mr. Ince had great pleasure in seconding the resolution. It was one of those subjects on which it was not necessary to enlarge, and it was useless to attempt anything like praise, the beauty of the grounds and colleges of Oxford were too obvious to need reference, but he should just like to mention for one moment the perfect way in which the music on Tuesday afternoon was rendered.

The vote was carried unanimously.

Mr. Atkins said it was with extreme pleasure that he moved the resolution which had been placed in his hands, for whilst they

had much to be thankful for, fine weather, an excellent President, a good address, and graceful hospitality, they had now specially to thank the Master and Fellows of Balliol College for the use of their hall during the visit of the Conference. That was a motion which needed nothing to commend it. They had had a warm welcome by the Master of Balliol, and they had the continued presence of the late master, whose beautiful portrait he would call attention to. He wanted them to remember that they had sat in a hall that was marvellous for its antiquity and history. As he had been sitting there the last two days his thoughts had been going back to the long, long succession of distinguished men who had belonged to that great Balliol Hall or College, which only yielded in antiquity certainly to Merton, and sitting there he had felt that in a certain way all the dignity and learning and grace of the past was resting upon them. The least they could do, and the most they could do, was to tender their most enthusiastic thanks to the Master and Fellows for their great hospitality.

Mr. Moss seconded the motion very heartily, and it was unanimously carried.

Mr. Cross moved,—

> "That the cordial thanks of the visiting members of the Conference be given to the local committee, especially to the President, Mr. Prior, the Secretary, Mr. Henry Mathews, and Mr. G. C. Druce, for the very successful manner in which they had carried out the arrangements of the Oxford meeting."

The success or otherwise of the visit of a conference to a town was in exact proportion to the way in which the local committee forwarded the arrangements, and as they all felt that their Conference had been a great success in Oxford, it followed that these gentlemen had done their duty and made the best arrangements possible. It was a source of pride and satisfaction to those who came from all parts of the kingdom to feel the honour in which pharmacists were held, even at one of the chief seats of learning; that rooms like that were placed at their disposal, and men of high calibre could welcome them.

Mr. Naylor seconded the vote of thanks. He said he had been deputed to do so because he might, perhaps, have some little sympathy with the gentlemen who had undertaken those labours, more especially the secretarial duties. It had been his pleasure to be in constant correspondence with Mr. Mathews, not only for

some few weeks, but for many months past, and he could form some idea of the magnitude of his work, and knew that he had devoted himself to it most loyally and enthusiastically. Those in London knew Mr. Druce better than Mr. Mathews, and they all had a proof of the fact that he had assisted on every available occasion, and no doubt the distinguished chairman of the local committee had also been of great help.

The PRESIDENT said he came to Oxford three months ago, when he first met the genial chairman of the committee, and spent a very pleasant hour or two in his company. He was next conducted by Mr. Mathews round the various colleges and halls, to advise which would be suitable, and practically he believed the whole of Oxford would have been available if they had required it.

The motion was carried by acclamation.

Mr. PRIOR said he must disclaim any credit due for the arrangements which had been made, as he had very little to do with them after the invitation had been sent, the main part of the work being done by Mr. Mathews.

Mr. MATHEWS, on behalf of the committee, thanked the Conference for the kind manner in which they had received the resolution, and assured them that on undertaking the duties of local secretary he felt he was undertaking rather a big task, as he was a stranger to the requirements of the Conference; but he felt that Mr. Thompson, his esteemed friend, and perhaps Mr. Clayton, would assist him, and they had very greatly lessened his labours. Although other members of the craft had not been active members of the committee, he could assure the Conference they had their sympathy. Many of them were in a peculiar position, being single-handed, and unable to leave their business; but this had given him an opportunity of calling on them, and they had all, with one accord, given their hearty welcome, expressed their sympathy with the Conference, and the majority promised pecuniary support, should it be required. He hoped that would not be the case. He thought that meeting at Oxford had been the inauguration of a little different system, inasmuch as it was particularly requested that they should endeavour to carry out the arrangements so that the Conference should be a self-supporting institution. In the early stages of his arrangements he was somewhat grieved to hear several remarks made in different parts of the country that many friends were called upon to give subscriptions to support the Conference, and did not pay them. He felt this was wrong;

but the Conference did not require it. He hoped they would be able to show that the Conference could pay its own expenses, and go where it liked, without being tied to any one. This would give the Conference the opportunity of visiting smaller towns and cities. Oxford was a very small place to what it had been in the habit of meeting in, and he was sure their visit would be appreciated. A fellow-townsman told him that he ought to be thanked for inviting such an immense number of people to the town, as it must do a great deal of good. He thought they must do good not only to the town which they visited, but immeasurable good to themselves, as it brought the members of the craft in small towns out from the dull, miserable loneliness of their ordinary lives.

Mr. DRUCE said he told them at Nottingham that he felt very much of an impostor. That feeling had not quite left him ever since he gave them such a warm invitation. It was not received with the enthusiasm with which he gave it, but he felt still more of an impostor now, because of this vote of thanks, in which he really had no share. Circumstances over which he had no control prevented him doing any work before the meeting; but the Secretary had undertaken a very laborious work, and had carried it out in a very successful way. Since they had been there he had been trying to do what he could to make up for past neglect, and anything that he had done had been a labour of love.

The PRESIDENT wished to point out, in case something which fell from Mr. Mathews might be misunderstood, that the Conference had always been prepared to pay its own expenses; the members all paid their travelling and hotel expenses, but it was impossible to calculate such little items as printing and other things, and there must be a margin on one side or the other. At Oxford, as Mr. Mathews had told them, they had made arrangements which, it was hoped, would prevent the margin being on the wrong side. If in some places the local people had spent money, it was not the fault of the Conference at all.

Mr. REYNOLDS said he had now to discharge a duty which he wished was in the hands of some one who could do greater justice to it. The Oxford meeting had been undoubtedly one of the greatest successes of the Conference. They had travelled for thirty years over the length and breadth of the land, and had received a welcome wherever they had gone, but they had never been more fortunate than they had been at that meeting. Perhaps one reason was that Oxford was not the property of one class of Englishmen; it was the property of them all. It was the first

and greatest seat of learning in England. From the days of Alfred it belonged to English men and women. As they looked over the streets of the city to-day, they saw that they were determined that England should come and share it. The extension movement showed how wide the sympathy of Oxford was at present. Surely they had been extremely fortunate in meeting there. He did not wish, however, to travel over the ground occupied by previous speakers; his concern was to express, on behalf of the meeting, how well satisfied they were with the conduct of the President. There had been incidents which they could certainly never forget—the welcome of the Master of Balliol, the presence of Sir Henry Acland, and the cordial way in which he recognised the relation between medicine and pharmacy, and the President, on his behalf and their own, accepted that position with a dignity which was equally gratifying to them. They were very fortunate in having a President so intimately connected with those more modern branches in connection with pharmacy and medicine, so that he was eminently the right man in the right place on such an occasion. He therefore begged to move,—

> "That this meeting recognises the ability and courtesy with which the President has conducted its business, and accords to him a hearty vote of thanks."

Mr. MARTINDALE had great pleasure in seconding the motion. They all had great respect for the President, and only regretted that he had suffered so much from loss of voice, which must have been a very great discomfort to him; but they were very grateful for the kind manner in which he had managed the meetings. They knew his character pretty well; altogether he had kept them thoroughly alive, and they had no doubt that he would have the same effect upon them at their ensuing meeting at Bournemouth.

The vote was carried by acclamation.

The PRESIDENT said if he had had a voice he did not think he could tell them how much he appreciated the honour of receiving this vote of thanks. But if in any small measure he had deserved the honour of being elected to the presidency of this important Conference last year, and the warm praise that had been given to him, it was due to the fact that in his early pharmaceutical life he had ideals, and they were contained in the names of the presidents of the Pharmaceutical Conference—he would not specify them, but those men formed his ideals in pharmacy; he had striven to emu-

late them. The President was absolutely a nonentity unless he was supported not only by numbers, but by important papers, and it was a remarkable thing that in one or two respects his address was almost prophetic. He said he hoped the papers might come in such numbers that a day or two might be added to the Conference, and he was not quite sure that it would not be wise to give another day to papers and discussions, some of which had had to be curtailed. He hoped next year every member would come and bring at least one friend, for there were hotels and lodging-houses at Bournemouth to any extent. With regard to his re-election, as the members did not exercise their right of challenging the nomination of the Executive, he would only say that it was a very nice question with him whether he should accept the presidency for another year, and one which he found it very difficult to decide. He was a Tory by descent, in all his instincts and habits, and when he was asked to do anything he always referred to precedents, and then did as his conscience dictated. In this particular case he found that in thirty years there had been twenty presidents of the Conference, ten who held the position for two years, and ten for one, and as there was no guidance there he had to fall back on something else. Here he was guided by sentiment; the first president was his old master and father in pharmacy, Henry Deane, and later, his predecessor and dear friend and elder brother, Henry Brady, so following their example he accepted the nomination of the Committee for the second time, and allowed himself, perhaps unwisely, to be elected for another year.

Mr. CARTEIGHE said that, formally or informally, some public recognition was due to the secretaries of the Conference. He was an old secretary, and knew the chief business of a secretary was to take care of his chief, to do all the work, to let him get all the acclamation, and take all the scoldings if anything went wrong. He had had the experience of being chief as well as secretary, and thought the thanks of the Conference were due this year, as they had been for several years, to their two excellent secretaries. For the encouragement of those who wanted to take an active part in pharmacy, he did not know any better training than to become one of the honorary general secretaries. It not only taught you a certain amount of systematic work if you did not know it, but encouraged you in the art of speaking. He had heard Mr. Naylor that day make one of the best speeches he had ever heard at a meeting, and he could remember the time when it was very difficult to get him to open his mouth at all. He would therefore move,—

"That the best thanks of the Conference are due, and hereby tendered, to the Hon. Secretaries for their arduous services during the past year."

Although he had not of late years attended the Conference as often as he used to, he had been a pretty regular attendant at the committee meetings, and knew the time and effort that was put into the work by both hon. secretaries.

Mr. UMNEY had much pleasure in seconding the motion, which was put and carried unanimously.

Mr. NAYLOR said they were rather unaccustomed to anything in the nature of a formal vote of thanks, but it was extremely kind to remember them that day.

Mr. RANSOM also briefly acknowledged the vote, and the proceedings terminated.

EXCURSION TO ABINGDON.

Members who attended the Conference, and their friends, to the number of about 200, assembled at Folly Bridge at 9 a.m. on Thursday, August 2nd, and boarded the two house-boats which were in readiness to convey them to Abingdon. The weather was cool, and the sky overcast with clouds that threatened rain. On reaching Nuneham a heavy shower cleared the upper deck and drove the party below, where, comfortably housed, they were entertained the while with music and songs. On nearing Abingdon, which was reached at 12.45, the sun coyly smiled at intervals, and favoured the excursionists for the remainder of the day with refreshing reminders of his presence. Luncheon was served in the Corn Exchange, kindly lent for the occasion by the Town Council, and presided over by the Mayor—Herbert Clark, Esq. After luncheon Mr. S. R. Atkins, in his happiest style, proposed the health of the Mayor, to which his Worship responded with much cordiality. Mr. Storrar proposed the local committee, coupled with the name of Mr. H. Mathews, who warmly thanked the company for their generous appreciation of the labours of the committee. Mr. President Martin, in a few neatly expressed sentiments, toasted "The Ladies." Mr. G. C. Druce replied in a speech that rippled with humour and convulsed every one with laughter. The luncheon was not only substantial but sumptuous. After a visit to the picture gallery of the Council Chamber, under the guidance of the Mayor, the return journey was commenced. At

Nuneham Bridge a halt was made, and the time pleasantly occupied in strolling through the adjacent park and grounds. Tea was partaken of on the lower decks of the boats at five, after which the journey homeward was resumed, Oxford being reached amid a sharp shower at eight. Not a single hitch occurred to mar the excellent arrangements which the local committee with much forethought and care had projected for the comfort of their visitors. Abingdon will rank among the most enjoyable of the Conference excursions.

RECEPTION AND CONVERSAZIONE.

The reception by the President, N. H. Martin, Esq., was held at 8.30 on Monday evening in Christ Church Hall, by kind permission of the Governing Body.

The guests were received by the President, who was accompanied by Mrs. and the Misses Martin, and supported by members of the local and general executives.

The visitors having assembled, a very cordial address of welcome was delivered by Canon Ince, Regius Professor of Divinity.

At intervals during the evening a choice selection of music was given by Mr. Pimm's band. By means of a number of microscopes generously loaned by Professor Vines and others, a series of microscopical objects was exhibited, and attracted much attention. The other exhibits included apparatus to demonstrate the inhalation of oxygen and exhalation of carbonic anhydride by animals, kindly lent by Professor Haldane, and the harmonograph by Mr. J. J. Manly.

The famous Hall itself, with its priceless collection of portraits, was greatly admired, and contributed largely to the success of a very enjoyable evening.

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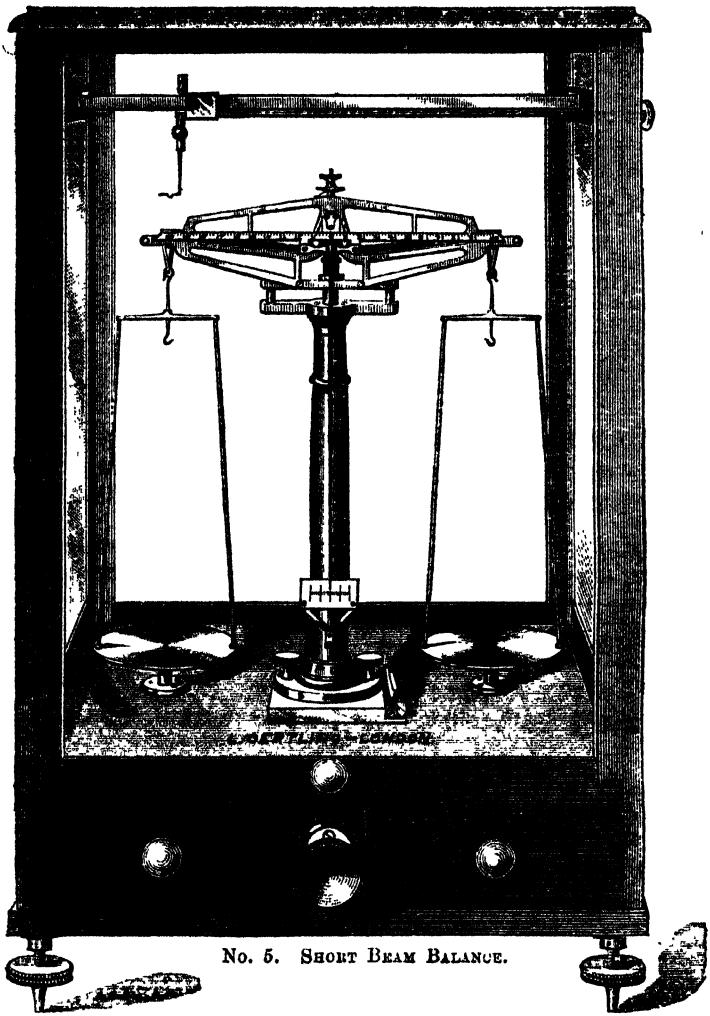
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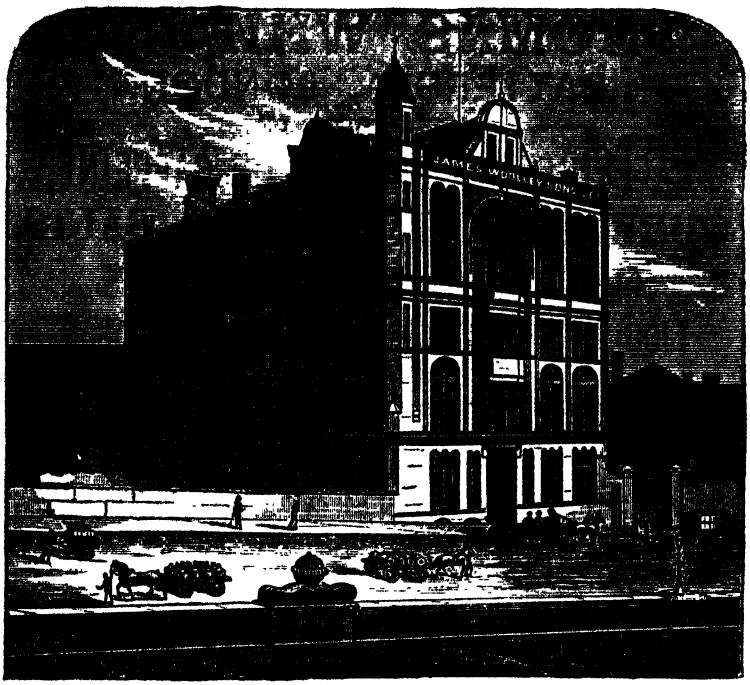
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Have gained a High Reputation everywhere. **FOR EXPORT TRADE**, they are put up in 1-lb., 2-lb., and 5-lb. Bottles. Packed in Casks or in 1-doz. Cases as required, and delivered F.O.B. at any Port in England. These Sweets are absolutely pure.

We specially recommend

Lime Fruit Tablets, Everton Toffee, Mixed Fruit Drops, Cough Drops, Raspberry Drops, Lemon Tablets.

Delectable, Voice, Glycerine, and Magnum Bonum Jujubes,

In 2-lb. and 4-lb. Decorated Tins (Tins free); and 4-lb. Glass Jars (Jars free).

COMPRESSED CHLORATE OF POTASH PELLETS,

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And PELLETS of every description, put up in 1-lb. White Flint Glass Bottles, with Boxwood Top Corks. Bottles not charged.

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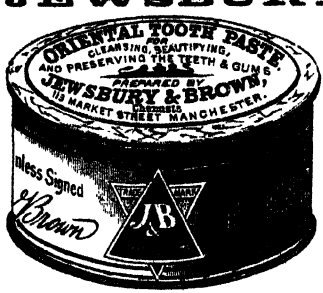
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IN BOXES OF ONE DOZEN OF EACH SIZE.

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Trade Terms on application.

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☞ If desired, we can supply the "Acme" Weed Killer *double strength*, 1 gallon to be mixed with 50 gallons of water.

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Testimonials received from Mr. HEAD, Crystal Palace; Mr. IRWIN LYNCH, Cambridge Botanic Gardens; and others.

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Purest and Whitest Quality. Cheapest Sellers in the Market.

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IMPORTED AND INTRODUCED BY

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Retail	...	...	...	1*s.* 6*d.*	Wholesale	... ...	12*s.* per doz.
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Vaccination from the Calf daily from 11 to 12 o'clock.

Prices of Calf Lymph.

Tubes	Large	... ...	2s. each, or 3 for 5s. 6d.
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HUMAN VACCINE, from healthy children only, microscopically examined, and source quoted.

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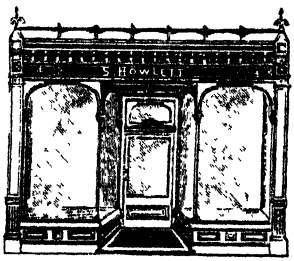
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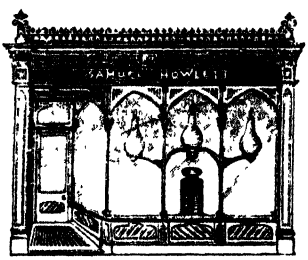
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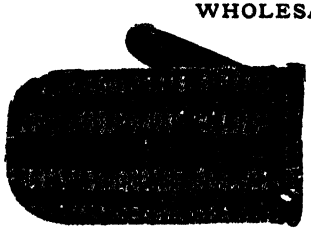
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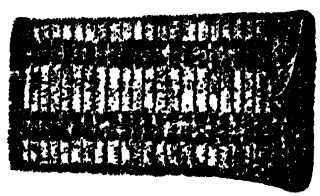
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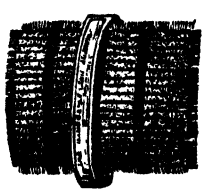
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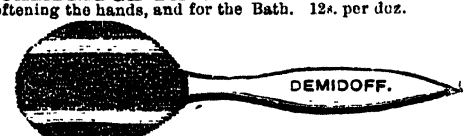
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